Operation of a Central Station Heating Plant—
Rural Service from Iowa Transmission Lines and the regular departments.

Engineering JUL 31 1916
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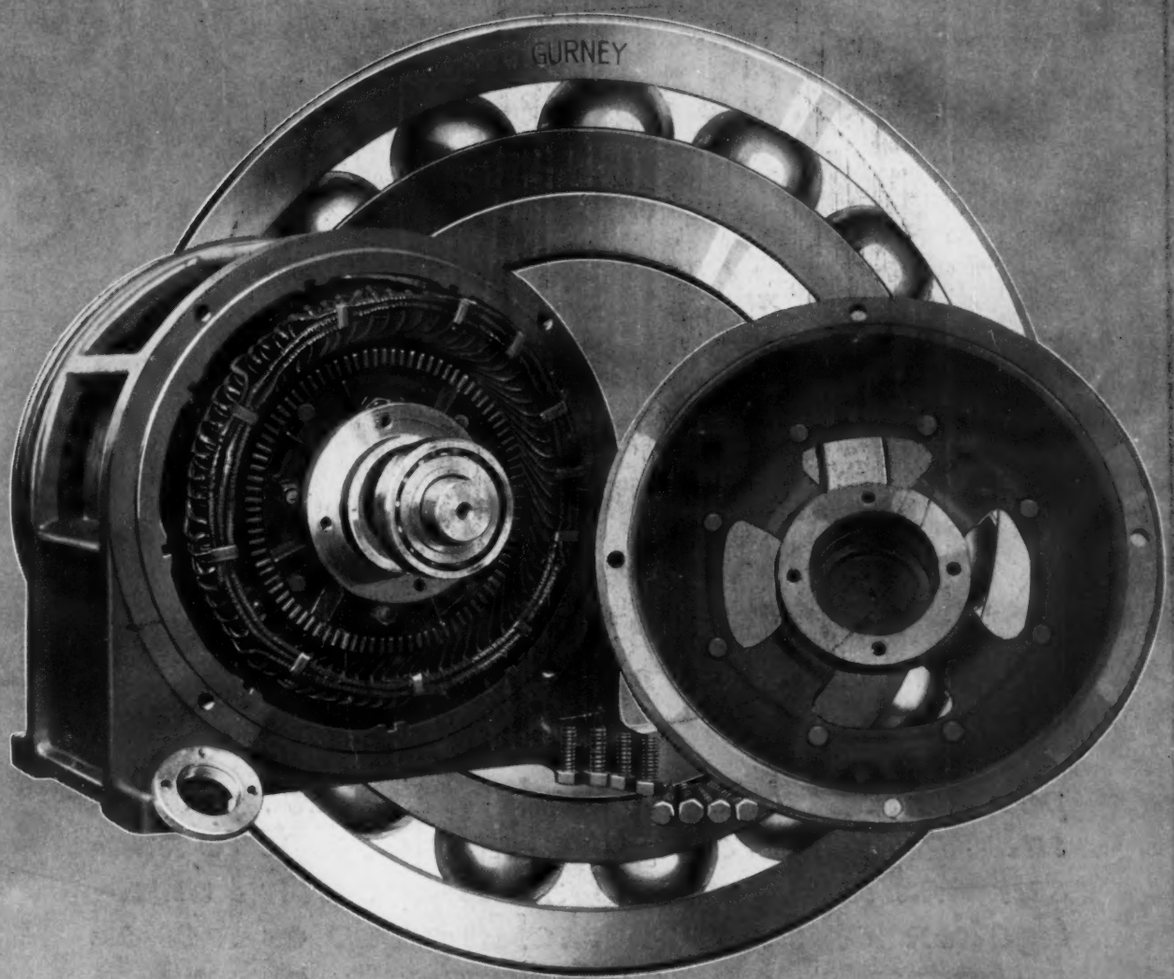

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Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
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Industry Handicapped at Niagara Falls

BUSINESS men of Buffalo and Niagara Falls have succeeded in bringing a congressional committee to view Niagara Falls and the cities and industries dependent on it for power. Their aim is to get some relief either in the shape of a permit to use the 4400 cu. ft. of water per second still available to the United States for power purposes under the treaty or additional diversion of water from the stream. That which is still available can be turned to instant use by the power companies who have the necessary turbines and generators standing idle; but the 80,000 hp. will be gobbled up at once so great is the demand for power. The relief would therefore only be temporary, yet such relief is better than none. Much that Congress should know was imparted to the committee by the electrochemists and we trust most of it sunk in. There is a lot of tom-foolery about Niagara Falls indulged in by people who never saw the place. Its industries, which many other cities covet, are of more importance to the inhabitants of that place and to the country as a whole than the mighty cataract itself. Yet through some freak of human frailty the power companies as well as the users of power there, are looked upon as vandals, despoilers of the country's scenic grandeur, lacking in finer sensibilities, art and patriotism, and having but one consuming passion—to use every drop of water plunging over the precipice at that point.

Pride in Industry

PENNSYLVANIA is proud of her coal mines, her iron foundries and her steel mills because they mean wealth to her people. Though the owners thereof rob the hidden treasures of earth, mar the scenery with huge banks of culm and slag, and darken the heavens with their smoke, it is the dirt of industry and her people love to see it. On the other hand, the power plants at Niagara Falls are temples of art, finer and grander than the public edifices of the city. They are not eyesores, belch forth no black smoke and use the power in the falling water without harming or consuming it. Niagara's electrochemical industries are the greatest in the world, are indispensable to many other industries in the country and because of power, labor and market conditions cannot easily be moved. Considering the number, size and importance of her industries, Niagara Falls, N. Y., is one of the cleanest manufacturing centers in the country, and yet the state of New York evinces no pride apparently in their possession. The city and state must bestir themselves lest these industries be lost to them and the federal government also must do its share if they are not to leave the country and locate under more favorable circumstances, as some have already done, in Canada, France and Norway.

Nearness to Market Essential

AS POINTED out elsewhere in this issue, the great waterpowers of the West are not attractive to the electrochemical industry because of their distance from raw material and from the market. The electrochemical industry was born and reared at Niagara Falls and there is no reason why it should not be retained there. Erroneous impessions prevail that the electrochemists seek to rob the falls of their beauty, for their own selfish ends. Such is not the case. Electrochemists seek not only to preserve, but to enhance the beauty of Niagara Falls by the installation of a submerged dam which will regulate the flow and at the same time permit the diversion of more water for power purposes. This is a matter which can be passed on by an engineering and arts commission made up of representatives from the United States and from Canada. Left as it is, the cataract in time will no longer be inspiring. Congress should, therefore, place the matter in the hands of a joint commission to report impartially on a plan for preserving its beauty. It is possible to improve the scenic appearance of Niagara Falls and at the same time divert considerably more water for power purposes. Fortunately these two conditions go hand in hand and are not inimical as so many people seem to imagine.

Basing Selling Policy on Service

SERVICE is the thing which determines continuous prosperity in the central station business. When a contract is taken and a new customer wired in, the real responsibility of the supply company is only beginning. In the long run its prosperity depends on the thoroughness with which the territorial resources are utilized, not on the amount of connections made in any month at prices that are barely on a paying basis. Contract agents are too commonly rated on gross output sold instead of on the effectiveness with which they have worked up their territory and the rarity of complaints from their customers.

The result is that many prospects are overlooked, much small but remunerative business is neglected, and larger but relatively unremunerative customers, whose service is a perpetual source of wrangling, give the agent an altogether undeserved reputation as a hustler. The spirit of the selling policy suggested by Mr. Learned on

another page, therefore, seems particularly in line with the needs of the average central station.

By Mr. Learned's plan every employee of the company is made, by a very simple system of prizes, a volunteer forager for new business, always keeping an eye out for the sources of profit to the organization. Employees report the prospects so that they may be placed in the proper hands for working-up by the contract department. One is often amazed, in going through the territory of a supply company, at the amount of ground untouched, passed over as not worth while or neglected from inattention. The method of all-round watchfulness is certain to lead to better results. We are tempted to suggest in addition that numerous prospects reported in a given salesman's territory form a certain sign of misdirected effort, or negligence, or perhaps of too great territory covered, and that an investigation of the circumstances is called for. Few companies can keep a selling force big enough to cover their territory properly and efficiently, but all can at least make an effort to work the ground thoroughly as far as they go. The team work necessary to this end means that every employee should be on the lookout for anything that may help on the common cause, and, as Mr. Learned's paper shows, it is a very easy matter to stimulate an interest that will bring prompt results in increased business.

Doing Business in Rural Communities

THE N. E. L. A. committee report from the Iowa section contains much of interest to transmission companies doing business in rural communities, as it has been shown many times that good business may be had from farmers. The chief difficulty to be met is the wide scattering of customers which results in disproportionately large overhead charges and costs of maintenance in distribution. As a rule the territory can be reached only by lines operating at fairly high voltage. The result on the individual installation is that one must either provide small transformers to step down from the transmission voltage to that suitable for lighting and motors, or reduce the voltage twice, once for a scattered group of customers and again for each one of the group. It is clear, therefore, that the costs must run high and that in one way or another the company must be recouped.

One of the interesting remedies suggested is the possibility of co-operative action among the farmers, building on their own account a distributing system, buying energy at wholesale through a single meter from the transmission company and distributing it as required among the members of the organization. Although this has actually been done in comparatively few instances, it has not infrequently been recommended, and it has some advantages. For one thing, it gives the users a full comprehension of the real costs and difficulties of a scattered service. At the same time it permits them to get power on favorable terms by purchase at wholesale. They take the responsibility of service in return and from familiarity with it get a broader view of the transmission situation. Fortunately the costs of rural lines can be kept down to modest figures; there is practically no substation burden, save in maintenance, and the plan encourages the spirit of team work in the community—always a good thing.

But there are many cases in which co-operative action seems inexpedient or is difficult to secure. These must be dealt with by the transmission company. The committee recommends that in general the farmer or any other isolated customer should pay for the necessary connecting lines, to be owned and maintained by the company under its own franchise. The transformers and auxiliary apparatus should then be installed and maintained by the company, and a rate charged sufficient to cover the additional costs of service to the scattered customers. It strikes us that if this scheme were followed the rates would often be forbidding. It is not a generally recognized policy to make a rate higher for a distant customer than for one who is lucky enough to be near the lines, and it is a grave question whether the commissions would recognize the necessity for such a procedure. It would seem best to make any differential charge on the basis of a minimum monthly guarantee, or by a lease charge on extension line and transformers, rather than by any change of rate for rural service. To build up much load of this sort the transmission company must in some way help in the financing of the extension work much as it often does in a housewiring campaign.

Magnetic Amplifier in Radio Work

REFERENCE is made in our Digest this week to the operation of a magnetic controller for telephonic current amplification in radio telephony. The mode of operation of this magnetic amplifier is very interesting. The ordinary telephone transmitter, as used in wire telephony, only delivers and controls a relatively feeble alternating current and power. The human voice does not, in itself, represent a large amount of power in sound, and the ordinary carbon transmitter is designed rather for definiteness and reliability in service, than for amplification purposes. In radio telephony, alternating current power of vocal outline must be developed lavishly at the sending antenna, if the voice is to be heard and interpreted at great distances. Consequently, long-distance radio telephony calls for the amplification of vocal power in alternating-current form.

In the magnetic amplifier the magnetic permeability of iron and steel is the source of action. Iron is magnetically the great marvel of the world. Without iron, and its high magnetic permeability, the modern dynamo could not exist. It is not too much to say that practically all electrical engineering is based upon, or depends upon, the magnetic properties of this wonderful metal. The impedance of a reactor, whose coil carries an alternating current, depends upon the permeability of the laminated steel in its core. If the steel is nearly saturated, the core virtually behaves as though it were made of wood. If, on the contrary, the steel is operated at a

suitably low magnetic density, the magnetic flux developed in the core may be thousands of times greater than if the core were wood.

In the telephonic amplifier, the voice currents are carried from a local transmitter through a coil on the reactor in such a manner that the voice currents can rapidly alter the permeability of the core, and so that alternating-current from a high-frequency generator, passing through the working coil of the reactor, has its impedance constantly changed by the independent action of the voice currents. This vocally varied impedance is then connected, either in series or in parallel with the sending antenna, so that the alternating-current power emitted from the antenna into surrounding space is large, and is powerfully varied in accordance with the vocal tones at the transmitter. We may hope to see this, or some similar device, developed to such a degree that a man talking to a transmitter with a watt or two of acoustic power, may cause his associated antenna to talk with hundreds of kilowatts of alternating-current power. The ancient Greeks boasted of their Stentor, with his brazen lungs; but the future electrical Stentor may have a 100-kw. voice. It is to be hoped that such tremendous utterances may be both musical and captivating, for the world would be a dreary globlet with 100-kw nasal voices perpetually shouting platitudes to the ethereal vault.

Engineering Experiment Stations

IT is now generally accepted that the system of Agricultural Experiment Stations established in the United States by the federal government has been both successful and remunerative. The difficulties in the way of applying science to farming and agriculture are probably greater than would be found in applying science to any other industry. This is not because of the highly developed existing condition of either knowledge or practice in agricultural industries. It is because of the adverse attitude of mind which necessarily has to be overcome before scientific progress can be made in farming.

The work of the farm is coeval with civilization. It is essentially a business of tradition and time-honored customs. The rotation of crops is said to have been known and practised in ancient Egypt. The advent of new ideas is apt to be regarded by the farmer with suspicion. He has a lively recollection of past failures due to unfortunate innovations. Moreover, an experiment in a machine shop may perhaps prove its success in a single day; whereas an experiment with crops commonly requires a year for its first trial. It is, therefore, not to be wondered at that farmers, as a body, regard experiment stations as an experiment.

On the other hand, the same mental inertia and conservatism which keep the farmer on the side of caution in adopting changes of conditions and technique, tend to make him an earnest advocate, when once won over by demonstration and achievement, so that the fact that farmers are now sending their sons to agricultural schools and stations indicates that the old order of the open field and closed mind is already departing to keep old traditions company.

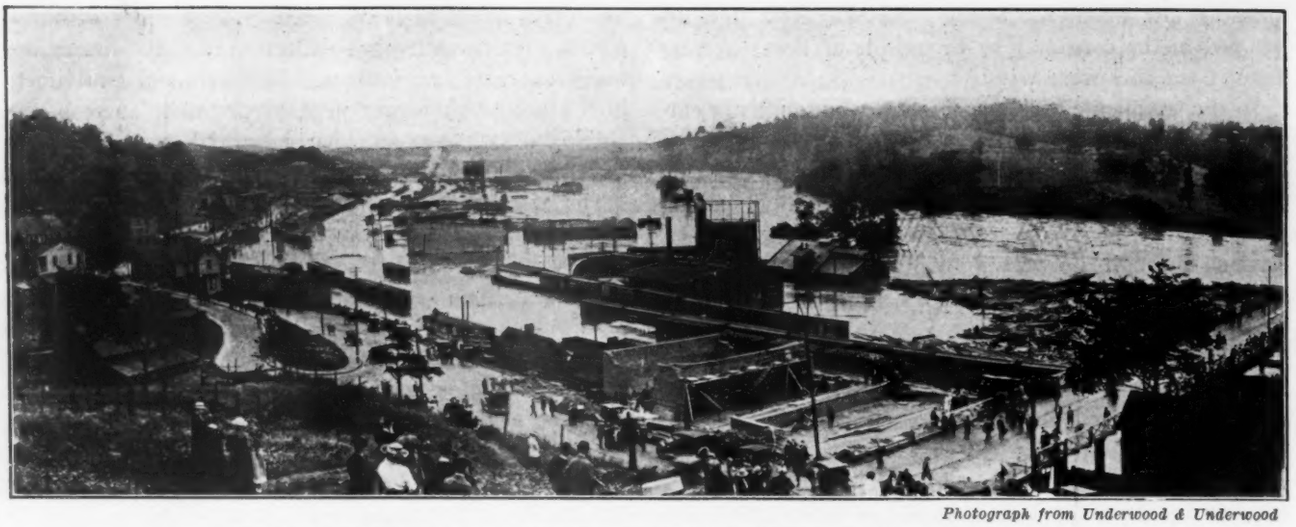
In engineering and the manufacturing industries there is not and never has been the same thickset hedge of established beliefs to penetrate. The manufacturer is either already convinced, or ready to be convinced, concerning the advantageous possibilities of invention, scientific application, and economic studies in improving and increasing output.

The Newlands bill, now pending in Congress, seeks to do for the engineering and mechanical industries what has already been done under less favorable conditions in agriculture. It proposes to establish an engineering experiment station in each State for the purpose of carrying on researches, investigations and experiments looking toward the progress of the industries and industrial arts. The annual sum of $15,000 is to be appropriated for each such State engineering experiment station.

There can be no doubt that if this plan is properly and economically carried out it should prove amply remunerative, not merely in a financial way, but also in facilitating intercourse between science and industry, so that engineering, on the one hand, may be invited to pay attention to practical problems, and industrial establishments, on the other hand, may be more generally prompted to attack their problems in a sound and scientific way. The leading manufacturing establishments have already had to do so in order to succeed. The rank and file, with a little encouragement, will rapidly follow suit.

The Coming Issues

Next week, in the first or public-relations number for August, a leading contribution will point out "The Objects of Modern Co-operation," outlining the development of the new attitude in the industry which makes for a better understanding of production, overhead and selling expense. The costs of superseded equipment considered as a proper part of the capitalization of a public-utility corporation which has borne past burdens of expenditures for abandoned elements of plant, are discussed in another leading article. The recent trend of regulatory opinion is illustrated in the review of an important case decided by the Illinois public service commission to be presented in the same number. The issue of Aug. 12 is the station-operating issue of the month, in which among discussions of other problems will appear an article on reducing costs in the steam generating ends of electric stations. A method of calculating transmission lines will also be presented. The engineering number follows as the third issue for the month, and the fourth issue will contain articles and features on commercial and industrial practice with special reference to the opening of the fall season. The second or August number of ELECTRICAL MERCHANDISING, the new publication which extends to the electrical trade the editorial service of the ELECTRICAL WORLD organization, will appear on the fifteenth of the month.



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VIEW OF ASHEVILLE, N. C., SHOWING SECTION INUNDATED BY LAST WEEK'S FLOOD

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

CONVENTION OF CALIFORNIA CONTRACTORS AND DEALERS

Organization at Stockton Meeting Lays Plans for Amalgamating the Several Associations of Five Western States and British Columbia

The seventh annual convention of the California Association of Electrical Contractors & Dealers was held at Stockton, Cal., July 14, 15 and 16, with a total of 175 present. The first two days were devoted to business sessions and the third day was given over to a boat trip down the Sacramento River.

In addition to those who registered from the several districts comprised in the association, outside organizations were represented as follows: Los Angeles contractors, G. E. Arbogast, F. E. Newbery Electric Company, Los Angeles; Oregon Electrical contractors, J. R. Tomlinson, secretary Oregon Electrical Contractors' Association; Washington Electrical Contractors, H. L. Tingling, Edwards-Tingling Company, Spokane. The presence of these representatives made it possible to draw up tentative by-laws for the Western States Association of Electrical Contractors & Dealers, in which it is hoped that the interests in five States and British Columbia will be united. These by-laws are to be circulated among the several associations, and will then come up for final revision and approval. The by-laws committee consists of G. E. Arbogast, J. R. Tomlinson, H. L. Tingling and H. C. Reid of San Francisco.

At the general meeting of the association held on Saturday afternoon, the following addresses were presented: "The Development and Growth of Electrical Organization," W. L. Goodwin, vice-president and sales manager Pacific States Electric Company, San Francisco; "Governmental Co-operation in Association Work," Colonel Harris Weinstock, director State Market Commission; "Central Station Activities," S. Kahn, manager Western States Gas & Electric Company, Stockton; "Trade Acceptances," Russell Lowry, president First National Bank, Oakland.

The officers elected for the ensuing year are as follows: President, Frank J. Somers, Century Electric Company, San José; vice-presidents, H. C. Reid, Pacific Fire Extinguisher Company, San Francisco; M. L. Scobey, "Home Electrical," San Francisco; J. Gensler, Electrical Contracting Company, Oakland; M. F. Nagle, Bay Electrical Company, Oakland; C. V. Schneider, Electrical Supply Company, Sacramento; C. F. Youdall, Electrical Machine & Engine Company, Stockton; William E. Hayes, Hayes-Van Fleet Company, Santa Rosa. The last named is to represent a newly-formed district comprising five northern counties in California.

PUBLIC UTILITY BOARD CREATED FOR NEW ORLEANS

A City Commissioner of Public Utilities and Four Others to Constitute a Local Board with Board Powers to Regulate Service and Rates

The General Assembly of Louisiana has passed an act amending the act incorporating the city of New Orleans so as to provide for a board of public utilities for the city. The measure has been signed by the Governor. The board is to be composed of a city commissioner of public utilities and four other members who are qualified electors of the city. The members are to be appointed by the Governor. The term of office of the appointed members is to be four years, but the terms of the first members are to be for one, two, three and four years respectively. The men appointed to the board are to serve without salary unless otherwise provided by the Commission Council of the city. The terms of the members first appointed will date from Aug. 15, 1916.

The board is vested with authority to supervise and regulate the service rendered by all public utilities within the territorial limits of the city of New Orleans, and is authorized to fix reasonable and just rates of charges for the service and commodities supplied by the public utilities, to establish reasonable and just standards of service, to provide for accurate tests of the appliances for measuring the commodities supplied to

the public, to prevent unjust discrimination and extortion in rates, charges, prices, fares, etc.

The board is empowered especially to require corporations and other agencies operating street cars or other instrumentalities for the carrying of passengers within the limits of New Orleans to adopt reasonable necessary safety appliances and sanitary regulations, to re-establish and relocate or extend the routes of the street railroad upon such terms as may be mutually agreed upon between the Commission Council and the corporations operating the properties, to require reasonable and adequate street railway service, and to require any public service utility as a condition of its being permitted to engage in business in New Orleans to secure a license, franchise or permit from the Commission Council.

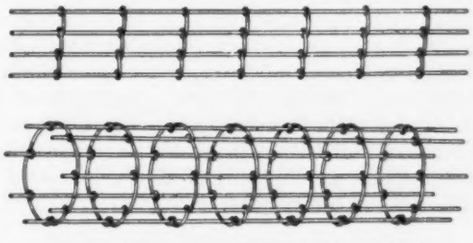
The act says that it shall be lawful for every public service utility to establish a sliding scale of rates, fares or charges, provided that its schedule showing such sale of rates, fares or charges shall have first been filed with the Commission Council and approved by it, and that it shall be lawful for every public service utility to establish with the consent of the council a scale of charges subject to automatic adjustment in relation to dividends to be paid to the stockholders or the profits to be realized by any single person engaged in a similar business. The Commission Council is empowered to delegate such of its powers and authorities to commissioners in the department of public utilities as may be necessary for the safe carrying out and execution of the purposes and provisions of the new act. The right of appeal to the court by any order of the Commission Council or the board is reserved to the utilities.

In commenting on the act, the New Orleans Railway & Light Company said:

"The directors, officers and management of the company entirely approve of this measure, both in principle and in its specific provisions. By it the company is assured a non-partisan board which will act upon all complaints brought to it by the public, and the board, acting for the public, must determine the justice or otherwise of such complaints. So far as the present law is concerned, we have nothing whatever to fear from it. We are conscious of the fact that the fundamentals of our several services are proof against attack. We are also confident that the company will get a 'square deal' from the board and that is all that we can ask or should expect."

Corona-Preventing Conductors

It is known that corona losses become very marked when for a given diameter of wire a particular critical voltage is exceeded. Up to this critical voltage the losses



CONDUCTORS FOR PREVENTING CORONA

are relatively small or even negligible. Furthermore, the losses for a given potential are greater for the smaller diameters of wires or conductors than for the larger ones.

In a Patent No. 1,190,135 by Giuseppe Faccioli, the inventor increases the virtual diameter of a conductor so far as corona losses are concerned by employing a reticulated conducting network. In this manner the electrostatic gradient becomes distributed instead of being piled up, as it were, over the surface of small curvature of the individual conductors of the network, or mesh.

REFINANCING OF PHILADELPHIA ELECTRIC COMPANY

Capital Stock to Be Increased from $25,000,000 to $50,000,000—Bonded Indebtedness of $60,000,000 Authorized

To provide for increased requirements made necessary by rapidly growing business, the directors of the Philadelphia Electric Company have submitted to the holders of the company's trust certificates a plan of reorganization of the company's finances.

After giving consideration to several methods of financing the management decided that the plan most advantageous to the security holders and the company is the unification of the various plants and properties into one ownership by a transfer to the Philadelphia Electric Company (of Pennsylvania). In order to accomplish this purpose, it is proposed: That the authorized capital stock of the Philadelphia Electric Company (of Pennsylvania) be increased to $50,000,000; that the Philadelphia Electric Company (of Pennsylvania) authorize a bonded indebtedness of $60,000,000 to be secured by a first mortgage, the bonds to bear interest at the rate of 5 per cent and to mature in fifty years, and approximately $35,000,000 of the bonds to be presently issued and the remainder reserved for future financing of the company; that the holders of the several issues of trust certificates be given the privilege until Sept. 1, 1916, of selling or exchanging their trust certificates upon the following terms: (*a*) The holders of Edison Electric 5's to receive $1,000 in cash, or at their option $1,100 face value of new 5 per cent bonds, for each $1,000 face value of said trust certificates; (*b*) the holders of the Philadelphia Electric gold 5's to receive $1,050 in cash, or at their option $1,060 face value of new 5 per cent bonds, for each $1,000 face value of said trust certificates; (*c*) the holders of the Philadelphia Electric gold 4's to receive $850 in cash, or at their option $860 face value of new 5 per cent bonds, for each $1,000 face value of said trust certificates or $1,000 face value of new 4 per cent bonds, secured by the same mortgage, for each $1,000 face value of said trust certificate.

The present system of the Philadelphia Electric Company (of New Jersey) consists of the plants and properties of twenty-one different companies in the city of Philadelphia, substantially all of whose capital stock, with the exception of two of the companies, is owned by two New Jersey corporations, all of whose capital stock in turn is owned by the Philadelphia Electric Company (of New Jersey). The capital stock of nineteen of these companies in Philadelphia and of the two New Jersey corporations is pledged as collateral for the various issues of the outstanding trust certificates, as follows: $1,994,300 Edison Electric 5 per cent stock trust certificates; $11,268,060 Philadelphia Electric 5 per cent gold trust certificates; $15,014,142 Philadelphia Electric 4 per cent gold trust certificates, or a total of $28,276,502 outstanding trust certificates.

The capital stock of the remaining two companies owning plants and properties in the city of Philadelphia, namely, Kensington Electric Company and the Philadelphia Electric Company (of Pennsylvania), is likewise owned by the Philadelphia Electric Company (of New Jersey), but is not deposited with the trustees as security for the trust certificates.

The Philadelphia Electric Company (of Pennsylvania), organized under the laws of Pennsylvania in 1902, now operates, under a franchise from the city of Philadelphia, the entire system throughout the city of Philadelphia, either by its own plant or by virtue of leases made with the other operating companies, and since 1902 the principal additions to the plants and systems in Philadelphia have been made by it.

For many months an announcement of the reorganization has been awaited. It had been rumored for more than two years, and with the company's growing business and the necessity for additions and improvements to the service a refinancing scheme seemed inevitable. It is probable that the plan would have been submitted to the certificate holders many months ago if it had not been for the controversy between the company and the city government over the question of rates.

This, however, was settled by a compromise, and with it out of the way the officials were in a position to turn their attention to the reorganization which had been temporarily put aside. The firm of Stone & Webster was employed by prominent banking interests of the city to make a thorough investigation of the company's physical condition and the possibilities of future growth. This report was submitted a few days ago and the final steps were then taken in the reorganization by President McCall and his associates. A letter explaining the plan in every detail has been sent to the stockholders.

President McCall, in explaining the reorganization plan, told of the rapid growth of the company's business during the past few years, and then continued as follows:

"The Philadelphia Electric Company has concluded the necessary arrangements to carry out its plan of refinancing. A favorable and satisfactory report upon the property of the Philadelphia Electric Company, which included its physical assets, its business organization, the present business and prospects for new business in the immediate future, has been made by Messrs. Stone & Webster, the well-known engineering firm of Boston, on behalf of prominent banking interests of this city.

"Very large sums have been expended each year since the incorporation of the company in order to standardize the electrical service in the city of Philadelphia and to build and equip modern generating stations of great capacity. The extraordinary growth in light and power business during the past five years and the rapidly increasing demand for the supplying of electric service to residences, commercial light and power, power in large blocks to big manufacturing interests, and power to the other public utilities of the city, have, however, made even larger increases in generating capacity, line extensions and distributing mains essential in order that the company may keep pace with the rapid growth of the city and to develop the possibilities of new business to the utmost.

"To provide the necessary capital in order to meet the increasing requirements of the public and to continue that high character of service which we feel it our duty, as a public service company, to furnish the community, it is necessary to refinance the property on a broad substantial basis which will provide for the demands of the consumers."

Flaming Arc Electrode

With the introduction of titanium carbid and calcium fluorid for the production of a white-light giving flaming arc, it is known that considerable difficulty has been experienced from the unsteadiness of the arc, change of color, flickering, etc. In Patent No. 1,189,265 Isidor Ledoff discloses a method whereby the color character of the light is not only stated to be improved but also its steadiness. To this end titanium oxid is employed instead of the carbid, and sodium fluorid instead of calcium fluorid. Moreover, by introducing barium fluorid not only is the color made more intensely white, but the stability of the oxid arc is increased. With the introduction of the fluxes cerium fluorid and thorium nitrid, which former alone gives a brilliant greenish color to the arc, it is claimed that a substantially white light is obtained of intense character.

COMMERCIAL PROBLEMS CONSIDERED BY OHIO ASSOCIATION

Round Table Discussion Brings Out Many New and Interesting Selling Ideas—Income of $30 Per Capita Predicted

The features of commercial day, July 20, at the convention of the Ohio Electric Light Association at Cedar Point (reported in part last week) were addresses by M. R. Bump of the Doherty Operating Company, New York, and by H. R. Grant, general manager of the Domestic Engineering Company, Dayton.

Speaking on the effect of the development of power loads Mr. Bump said, "In 1907 we bought an Ohio plant with a load of 750 kw. in a town of 15,000 inhabitants. The lighting business then produced 70 per cent of the revenue. Since that time the lighting revenue has increased 200 per cent, but it now produces only 36 per cent of the revenue. Yet the community served by this plant in 1907 was thought well developed electrically.

Incomes of $30 Per Capita Predicted

"I believe our industry is on the verge of a transition from a retail business to a jobbing and wholesale business, and it is safe to predict that the $5 per capita of revenue which we now consider a fair income will in a few years increase to $30 per capita. The factors which will bring this about are industrial power, industrial heating and electrified steam railroad loads.

"Many steam railroads are just at the point now where they must either electrify or install increased trackage to handle their growing business. The fact that bond issues for the increased trackage might be hard to float may be a deciding factor for electrification. Electrification will, of course, take place first in the more congested districts, but it must gradually extend to entire systems. In securing railroad business central stations must co-operate. There must be concerted and intelligent action in order that the railroads may be induced to purchase power instead of erecting generating stations of their own."

R. H. Grant, former sales manager of the National Cash Register Company, who is now engaged in the individual farm lighting set business, was most interested, he said, in the question of whether the manufacturers of the electrical industry are putting as much selling intensity into their business getting as are the manufacturers of specialty products. Electricity and electrical appliances, he contended, must be sold through intensive selling campaigns.

Data on Woodworking Plants

The report of the committee on new-business co-operations, presented by J. E. North of Springfield, chairman, showed that from reports received from eighty cities throughout Ohio the total available woodworking business not connected at the present time amounts to 22,625 hp., out of a total of 31,891 hp. At a low estimate of $12 per hp. a year, this load would net $271,500.

Those who participated in the discussion were: F. B. Steele, Dayton; W. A. Wadsworth, Cincinnati; P. H. Stambaugh, Youngstown; T. F. Kelly, Dayton; W. R. Power, Ironton; Weare Parsons, Springfield; H. B. Bixler, Akron, and John G. Learned, Chicago, Ill. Mr. Steele suggested that an analysis of reports on "lost business" might lead to the elimination of mistakes and prevent more business being lost. Mr. Learned outlined the plan used by the Public Service Company of Northern Illinois for interesting all company employees in sales work. The general trend of the discussion indicated that much business-getting data and inter-company help has been exchanged during the past year as the result of acquaintances formed at new-business committee meetings.

At the round table meeting on commercial topics, S. E. Doane of Cleveland made an appeal for mass action as opposed to mob action in central-station methods and practices in a paper entitled "From a Barter to Business Through Standardization." T. F. Kelly of Dayton read a paper on "Deposits from Customers." H. C. Gillie of Cleveland, acting for M. E. Turner of Cleveland, read a short paper on "Financing the Wiring and Fixture Installations for Contractors by the Banks as a Step in the Development of a Plan That Has Wired More Than 20,000 Old Houses." This plan was published in the ELECTRICAL WORLD March 25. Thirty contractors are now participating in it, and the largest number of contracts handled for any one contractor has been sixty-five. The total number of contracts handled thus far has been 221. The Guardian Trust and Savings Bank is very enthusiastic over the plan as a method of securing new and desirable business for the bank.

Increased Outlook for Central Station Earnings

I believe our industry is on the verge of a transition from a retail business to a jobbing and wholesale business. It is safe to predict that the $5 per capita of revenue which we now consider a fair income will in a few years increase to $30 per capita. The factors which will bring this about are industrial power, industrial heating and electrified steam railroad loads.

Many steam railroads are just at the point now where they must either electrify or install increased trackage to handle their growing business. The fact that bond issues for the increased trackage might be hard to float, may be a deciding factor for electrification. Electrification will of course take place first in the more congested districts, but it must gradually extend to entire systems. In securing railroad business, central stations must co-operate. There must be concerted and intelligent action in order that the railroads may be induced to purchase power instead of erecting generating stations of their own.—M. R. Bump.

INDUSTRIAL HEATING

Speaking on "Electric Industrial Heating," H. O. Loebelle of New York said when contracts now let are completed there will be a greater electric heating load in the United States than in any other country in the world. Yet the majority of central stations are only passively interested in electric heating. To show that the demand for electric heating will increase, Mr. Loebelle said that combustion furnace crucibles formerly costing $2.75 now cost $8, and give only an average of seven melts as against twenty-five. Labor has also increased in cost from 25 cents to 80 cents an hour, and these considerations, together with other high costs incident to combustion furnace operation, he predicted, will force the companies to adopt electric heating.

Others contributing to the discussion were: F. C. Caldwell, Columbus; Frank Glosser, Marion, Ohio, and H. J. Hoover, Cincinnati.

JOVIANISM AND AMERICA'S ELECTRICAL WEEK

At the last session of the convention addresses were presented by Martin J. Wolf of St. Louis on "Jovianism and Its Relation to the Electrical Industry," and by George W. Hill of New York on "America's Electrical Week," Dec. 2 to 9. Mr. Wolf intimated that the Jovian Order is the logical body to act as the active selling organization of the industry in making more effective the advertising propaganda of the Society for Electrical Development. He also showed how local leagues can assist public utility companies in molding public sentiment.

In its report the meter committee, of which A. H. Bryant of Cleveland is chairman, emphasized the increasing importance of the demand meter. The instrument is receiving a wide application and has added numerous problems of selection and maintenance with additional duties and responsibilities to the meter department. Many of these problems involve the consideration of company executives as well as accounting and sales department heads. Forming part of the report were a classification, a detailed description, and a statement of advantages and disadvantages of the types of demand meters now in use. Those who took part in the discussion were: H. B. Bixler, Akron; S. E. Doane, Cleveland; F. B. Steele, Dayton; Samuel G. Hibben, Pittsburgh, Pa.; Chester I. Hall, Fort Wayne, Ind.; A. M. Seager, Toledo; J. K. Hines, Dayton; Adrian Tobias, Youngstown; F. C. Caldwell, Columbus; R. S. Graves, Cincinnati; O. W. Jones, Columbus, and John Gilmartin of Detroit, Mich. The most perplexing problems in the minds of the delegates seemed to be those of proper demand meter maintenance under adverse weather conditions and length of time to be taken as the duration of the demand peak. Many speakers expressed approval of the graphic meter since the records it produces help the customer study his load conditions and enable him to avoid expensive peaks.

The report of the voltage standardization committee, S. E. Doane of Cleveland, chairman, showed that 77 per cent of the Ohio companies reporting to the committee expect to be operating at 110, 115 or 120 volts within a year.

The association by vote this year changed its method of selecting committees. Hereafter only the chairman will be named by the nominating committee and the other members will be named by the respective chairmen. Next year's convention will extend over five days instead of four, as has been the usual practice.

The following officers were elected: President, E. A. Bechstein, Sandusky; vice-president, O. H. Hutchings, Dayton; secretary-treasurer, D. L. Gaskill, Greenville; executive committee, T. O. Kennedy, Massillon, and E. H. Beil, Youngstown; illumination committee, S. E. Doane, Cleveland; meter committee, A. H. Bryant, Cleveland; transmission and distribution committee, M. H. Wagner, Dayton; new business committee, J. E. North, Springfield; standardization of voltages committee, S. E. Doane, Cleveland; insurance committee, L. K. Funkhouser, Dayton; advertising committee, T. F. Kelly, Dayton; station operating committee, Henry B. Dates, Cleveland; advisory committee, W. W. Freeman, Cincinnati; R. P. Stevens, Youngstown, and E. P. Matthews, Dayton; finance committee, E. L. Franklin, Warren; I. L. Oppenheimer, Pomeroy, and A. L. Thuma, Ironton.

New Massachusetts Legislation

Legislation enacted during 1916, and of especial interest to gas, electric and water companies and municipalities owning lighting plants, has been compiled by the Massachusetts Board of Gas & Electric Light Commissioners.

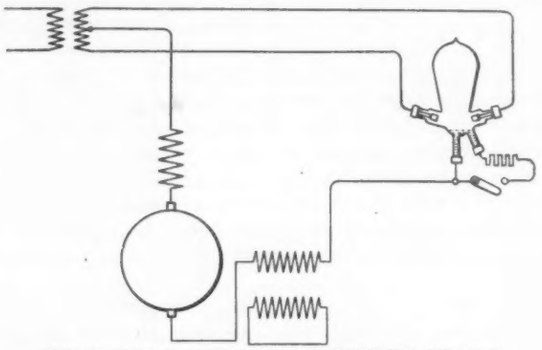
Particular interest attaches to the following of these newly-enacted laws: An act to authorize cities and towns to appropriate money for conducting proceedings in all matters relative or incidental to the prescribing of rates or fixing of charges by public service corporations or the exercise of rights under their franchises.

An act relative to the issue of securities by hydro-electric companies whereby the company may, subject to all provisions of the law issue preferred stock to such amount, not exceeding twice the amount of the general or common stock then outstanding.

An act relative to the regulation of the business of installing wires or apparatus for electric light, heat or power purposes whereby certificates issued to either master or journeyman are not assignable or transferable, and provision is made for suspension of license.

Motors for Pulsating-Current Circuits

A very simple device is proposed by M. Osnos in Patent No. 1,189,997 assigned to the General Electric Company for operating series motors on rectifier circuit systems. It is known that wherever there is a pulsating flux in a motor a transformer action takes place in the short-circuited coils at the brushes which results in poor commutation. In order to prevent pulsations of the flux



SERIES MOTOR OPERATED ON RECTIFIER CIRCUIT

the inventor suggests a saturated field in conjunction with a small air gap; or a neutralizing flux by means of a short-circuited winding in inductive relationship with the main field winding. Another suggestion is to increase the self-induction along the work axis of the motor by using a large air gap in this axis, and thereby preventing saturation, or even employing an uneven distribution of the compensating winding.

Municipal Plant Forced to Raise Rates

A new schedule of lighting rates embodying an increase of over 28 per cent was announced to take effect Aug. 1 by the municipal electric plant at Westfield, Mass. Manager G. E. Mitchell and the lighting board recently came to the conclusion that the increasing cost of materials and labor requires an advance, and both lighting and power rates have been raised as a result. The 7-cent per kw.-hr. lighting rate previously in vogue has been increased to 9 cents, with a minimum monthly charge of 50 cents. The power rates have been increased from a range of 2 to 4 cents per kw.-hr. to a range of 2.5 to 5.25 cents, with a minimum charge of 75 cents plus 50 cents per hp. or fraction.

NIAGARA POWER FAMINE AND THE ELECTROCHEMICAL SITUATION

Reasons Why American Industries Requiring Cheap Electricity Locate in Canada and in Europe Instead of on the Pacific Coast

At the luncheon-meeting given by the Niagara Falls Board of Trade to the members of the Committee on Foreign Relations of the House of Representatives two weeks ago, the electrochemists presented their side of the Niagara power situation, and showed the urgent necessity for additional power to the manufacturing industries located at Niagara Falls, N. Y. A short account of the hearing was published in the ELECTRICAL WORLD at the time.

Frequently many engineers and public utility managers having abundant and fairly cheap water power have wondered why it is that the electrochemical industries, now so badly handicapped in their development and growth at Niagara Falls because of shortage of power, do not locate on the Pacific Coast. During the course of the hearing at Niagara Falls this situation was touched on and disposed of by one of the speakers, F. A. Lidbury, manager of the Oldbury Electrochemical Company and a past president of the American Electrochemical Society. Mr. Lidbury in discussing this subject said in part:

"The electrochemical industry in this country is something of which we ought to be extremely proud. We hear a great deal about Europe being ahead of this country in chemical industries and similar lines, but there is one branch of the chemical industry in which this country has never had to take a back seat to Europe, and that is the electrochemical industry. As has been pointed out, this town is the chief electrochemical center of the world, and, in fact, some of the most important electrochemical developments were born here. This is particularly true of those industries which have had the widest and most important influence upon industries in general.

"Now we are not only proud of this development in general, but we are proud—and we have a right to be proud—of the resources and energy with which the electrochemical industries of this country, and specifically of this town, have, under conditions of extreme difficulty in certain respects, come to meet the situation in the way of increased demands or the substitution of one article for another, that has taken place since the war began. It would take too long to describe this, to explain in detail what has been done; but let me refer to just one specific case which involved throwing over one industry in order to bring up the production of ferrosilicon to a point where it could be of considerable assistance to the steel makers, deprived of foreign production.

CHEAP POWER ESSENTIAL

"The one thing I want to bring to your attention is what the present conditions are and what the outlook is. Ever since power restriction measures came into effect, there has been noticed a tendency, which recently has resulted in an acute condition, to shortage of power on the American side of the border here, and increasing prices, and greater stringency in contract conditions. The vital requirement of the electrochemical industry is abundant power and cheap power. Dear power is no good to it. As a result of these conditions, which started to show themselves immediately the power-restricting measures took effect, there was a tendency to the migration to other localities of plants which either originally began operations here or which would have naturally commenced operations here; and I want to specifically call your attention to the fact that the

majority of those migrations, and the most important of them, have been to other countries.

"As early as 1907 the first fixed nitrogen plant on this continent was projected. That was the American Cyanamid Company. After carefully looking around and seeing what could be done in the way of power sites in the United States, they decided to locate on the Canadian side of the border, just over the river here, and are to-day consuming something over 27,000 hp. in the manufacture of cyanamid, the market for which is entirely in the United States. The two companies which have revolutionized the abrasive industry have found it necessary to move the greater portion of their furnace operations to Canada, and in one case to France. Recently we have seen the Union Carbide Company erecting a plant to consume 100,000 hp. in Norway, and although it is not yet known where the product is destined for, the principal outlet, it is generally understood, will be in this country.

"We can only judge the future by the past and by what we see going on before us at present. What we see to-day is a tendency for these industries to leave this locality because of the lack of power, and to go, not to other parts of this country, but to other countries. Now, why is that? Outside of the power that has been developed here and that can be developed here, there are practically no water powers which offer sufficiently favorable conditions, or which show any prospect of offering sufficiently favorable conditions, for these industries; and there is a very good reason for that. There is lots of water power in this country, and I dare say there is lots of power which can be developed cheaply. Most of it is in the West. Now, the electrochemical products which consume this power have to be transported from one section to another. You can carry them just so far economically and no farther; and it happens that the consumptive outlet for the majority of the products that are made in Niagara Falls is in the manufacturing districts of the East. That is, of course, natural, because these products are fundamentally important ingredients of the products of the most important industries of the country. Consequently, to locate out West is to put a prohibitive transportation cost on the materials. In fact, calculations show that for the purpose of supplying the Eastern markets, the majority of the processes now at the Falls would have to get the power on the Western coast, not only for nothing but would have to get as much as a bonus as they have to pay for power here!

"So if industries move to other parts of the country they must go to localities from which they can transport their products cheaply to the manufacturing centers of the East, hence their location in Canada, particularly those portions of Canada which are near the border here, and which have water transportation, and their location in places such as Norway, from which water transportation is cheap and easy to the Eastern seaboard of the United States. Bad as power conditions now are here, they are likely to become worse. The Dominion Government has reduced the amount of power for which Canadian export permits are given and has served notice of its intention to reduce the exported quantities yearly at a rate which will bring exportation to a complete stop in the course of six or seven years. As at least one-third of the Niagara power used in the United States has been imported from Canada, we are faced with a further curtailment of our already restricted operations. Unless immediate and substantial relief is given, the already insufficient output of our electrochemical plants will be seriously and steadily reduced.

"Now, gentlemen, here is the question that we have got to face. Are we going to utilize our natural resources in this country to permit of the further normal development of these industries, which are of fundamental importance to every one of us, or are we going to close our eyes and let things take their course and see these industries gradually expatriate themselves? We have our choice. There is no third way. We have got to make up our minds that we have either got to develop these industries in this country or see them go abroad. It is easy to keep them. All we have got to do is to utilize, instead of allowing to go to waste, those natural resources which have been given to us and which cost us nothing. I think enough has been said to-day to give you an idea of what the frightful consequences may be if such another dislocation of the world's trade comes—if we have allowed these industries to grow up in other countries.

"Now I do not think that there is any consideration which is more important in this regard than an answer to the question so frequently put: What has the country got for the alleged spoilage and destruction of the scenic beauty of Niagara, this, that and the other thing that the alleged vandals have done at Niagara Falls? That answer is simple, plain and emphatic. All of you gentlemen know, and know thoroughly well, the effect of the scientific contributions to industry in the last fifteen or twenty years. You know thoroughly well that by those contributions the productive power of each individual in this country has been enormously increased. If you analyze the nature of these improvements, taking the mechanical industries, for instance, which this country is particularly ahead in, you find that the ability of one man to produce to-day what several men produced before is due—what to? To the contribution of the electrochemical industry to tool steels and to the technique and materials of grinding. The same thing—dependence on the products of Niagara power—is true to practically all the industries which have so enormously been improved in the last twenty years, and whose improvements by adding so greatly to the productive power of the individual, have enabled every man in the country to obtain a better and richer existence. That, gentlemen, is our answer to the question: What have you vandals done with Niagara Falls?"

Why Electrochemists are Not Attracted by Western Power

Electrochemical products which consume electricity have to be transported from one section to another. You can carry them, economically, just so far and no farther; and it happens that the consumptive outlet for the majority of the products that are made in Niagara Falls is in the manufacturing districts of the East. That is, of course, natural, because these products are fundamentally important ingredients of the products of the most important industries of the country. Consequently to locate out West is to put a prohibitive transportation cost on the materials. In fact, calculations show that for the purpose of supplying the Eastern markets the majority of the processes now at the Falls would have to get power on the Western coast not only for nothing, but would have to get as much as a bonus as they have to pay for power here! So if industries move to other parts of the country they must go to localities from which they can transport their products cheaply to the manufacturing centers of the East. Hence their location in Canada near the border, and in Norway, from which water transportation is cheap and easy to the Eastern seaboard of the United States.—F. A. Lidbury.

Central-Station Heating Plant Operation In Milwaukee

Advantageous Location and Turbine Installation to Produce Electrical Energy as By-Product from Modern Heating Plant—Net Income 8.1 Cents per 1000 Lb. Steam Sold

By O. M. Rau
General Manager Commonwealth Power Co., Milwaukee, Wis.

MANY central-station companies which operate steam-heating systems, do so largely because they are forced to and consider this phase of their business more or less burdensome. Few make sufficient profit from the business to consider it a paying one, and not infrequently the operators are heard to say that they wish they could get rid of this business altogether. This was substantially the case at Milwaukee, when the interests owning the Commonwealth Power Company expected to realize an enormous saving by replacing the individual heating plants in a number of buildings owned in the downtown district, by a central plant to supply all the buildings, and found after five years' operation that it was losing about $9,000 a year.

This original steam-heating plant was the result of a franchise granted the Continental Realty Company, and included an installation of three 250-hp. boilers in one of the large central office buildings from which live steam was distributed at 100 lb. pressure to the various buildings to be heated on account of there being a number of hotels and restaurants served which required high-pressure steam throughout the year. The pressure was then reduced at the customers' premises to such an amount as best suited the requirements. During five years' operation, no detail records were kept and no attempt was made to arrive at the cost of this method of furnishing service. It was assumed that the scheme was more economical than the individual boiler installations.

When it was discovered that the business was being conducted at a loss steps were immediately taken to rearrange the service and put it on a paying basis. Investigation quickly developed the fact that a different basis of charge must be made than that formerly used, whereby each building was charged for service on a flat basis per season equivalent to the cost of coal and labor which had been required to operate the individual plant. The flat rate was then abolished and a meter system installed. The plan of delivering high-pressure steam was also found to be expensive, maintenance high and losses excessive. The total amount of business on the system was also found to be too small for an independent organization properly operated, and it was decided to expand by adding buildings other than those controlled by the company. A canvass of the territory showed that there was sufficient demand for this class of service to warrant the installation of an up-to-date central heating plant, and accordingly the old plant was abandoned, with the exception of using it as a standby, and a new plant and distributing system installed. The location of the new plant, instead of being central to the load, was placed at the lowest point in the district to be heated, which meant that all returns would naturally flow back to the plant.

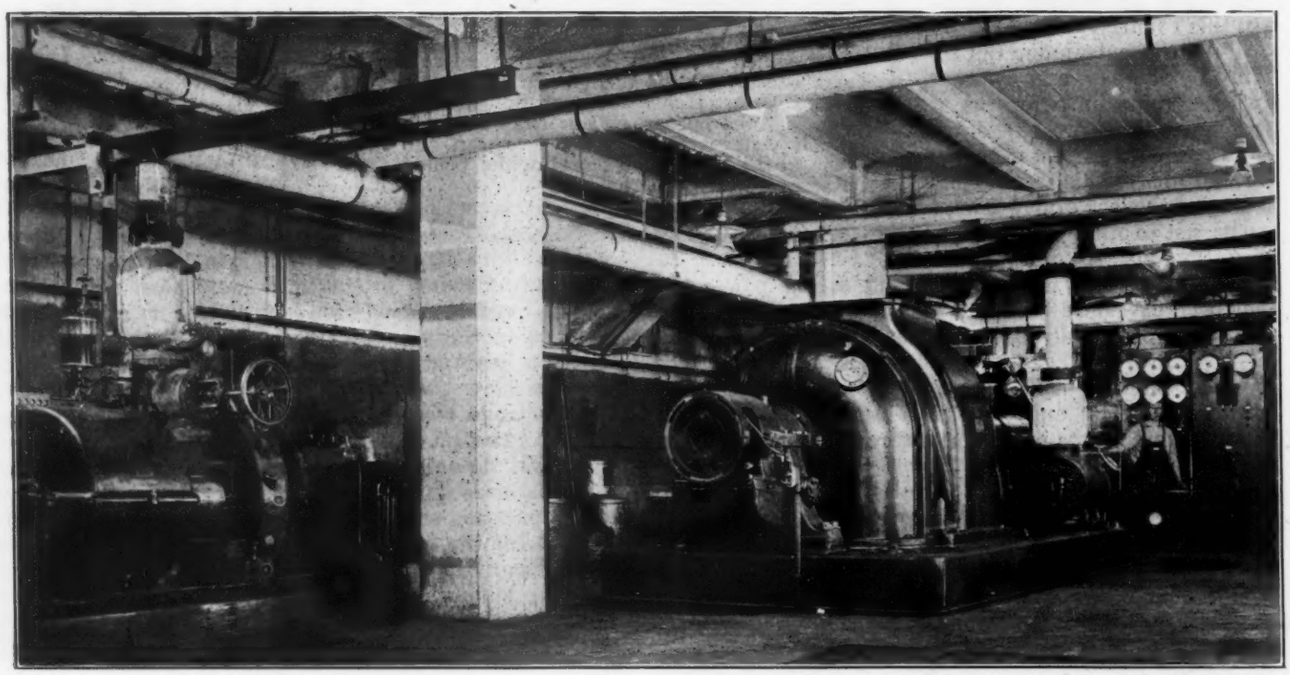


FIG. 1—TURBINE ROOM OF MILWAUKEE CENTRAL STATION STEAM HEATING PLANT IN BASEMENT OF BUILDING

The high-pressure system was abandoned for general heating and only used for furnishing high-pressure service for cooking or heating purposes requiring steam throughout the twelve months in the year. This service is sold at a considerably higher rate than the low-pressure service, which is furnished during the heating season only. The controlling consideration in the design of the plant was to keep the investment at a minimum, with as high efficiency as such a policy would

permit, the fact being kept in mind that the overhead expense of twelve months must be met from the revenue of the heating season, which usually does not exceed seven months.

EQUIPMENT OF NEW HEATING PLANT

The new central heating plant was placed in the basement of the Enterprise Building and equipped with three 500-hp. Edgemore boilers, fired with Swift stokers; a simple ash and coal-handling equipment consisting of scraper conveyor and traveling trolley; centrifugal-feed pumps; feed-water heater; hot-well for returns; individual recording coal scales at each boiler; steam flow meters; smoke recorders; Blonck efficiency meters and an effective ventilating system.

The turbine room was so built that it faces the front of the boilers and is separated from the boiler room by a large glass partition. In this room is installed a 1000-kw. Allis-Chalmers turbine, and a 200-kw. d.c. turbine, the exhaust from which provides the low-pressure steam for the heating system, the turbines acting as reducing valves. Recording low and high-pressure steam gages on the outgoing mains, recording thermometers and recording boiler pressure steam gages give a graphic record of the system, while proper electric recording instruments give the output of the generators.

The distributing system consists of two 16-in. cast-iron Universal pipe steam mains, leaving the station and looping the entire district with a return main and a high-pressure main paralleling the system. The low-pressure mains are laid in concrete trenches with a double covering of magnesia blocks over which is a waterproof roofing paper, wired to the pipe with copper wire. The high-pressure main is of standard pipe with magnesia covering and the return main is standard pipe uncovered. All pipes are supported on cradles to give ample space for any water which may accumulate in the trench to drain off and all pipes are laid with a pitch to the manholes and all manholes connected with the sewer.

The operation of the turbines is governed entirely by the demand for low-pressure steam, and the electrical energy generated is considered entirely a by-product. The generators are connected up with the buses of the Main or Commerce Street station of the Commonwealth Power Company, which supplies electric service to the central portion of the city, the agreement between the heating and electric-light companies being that the electric company will purchase all the electrical energy generated by the steam system and pay for it at the rate of $0.0095 per kw.-hr. for all energy taken during the peak load period and $0.005 per kw.-hr. for the balance. The output curve of the heating-plant generators, therefore, follows identically the steam-demand curve shown in the accompanying diagram. In operating the plant two crews of four men each are required for the day and night shifts consisting of an engineer, fireman, coal passer and switchboard attendant.

The customers served by the heating plant number eighty-four and are classified as follows: Seven hotels, forty-six office buildings, eight theaters, nine restaurants, and fourteen miscellaneous customers. The cubical space heated is approximately 17,000,000 cu. ft. and the radiation connected with the system is 200,000 sq. ft. Steam demand load curves for the low-pressure and high-pressure steam systems for a typical day in winter, are given in Fig. 3. The demand curve for a summer day would be approximately the same as the high-pressure steam curve on a winter day, as the low-pressure steam is off and approximately the same consumption is required on the high-pressure system, regardless of weather conditions. A curve showing the monthly output for twelve months, beginning and ending with May, and including both the high and low-pressure steam is also given and is accompanied by a curve showing the average temperature during the same period as recorded by the Weather Bureau for each month.

The success of the operation of central steam heating plants lies largely in the temperature of the water returned to the plant, and the soundness of this statement is apparent when it is considered that 75 per cent

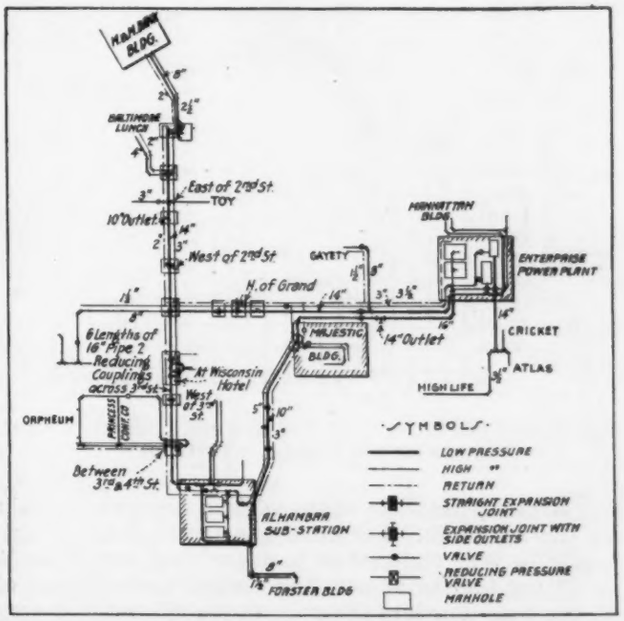


FIG. 2—LAYOUT OF STEAM DISTRIBUTION IN MILWAUKEE, WIS.

of the steam delivered is returned to the plant during the cold months at an average temperature of 140 deg. Fahr. No public utility requires the careful watching and detail study that the steam heating business does to obtain a net profit from operation. Where inefficient management would still allow other utilities to show a profit, the central station heating business would have to close down and it is the opinion of the writer that this is the reason so few heating plants pay.

The least looked after portion of any enterprise from an efficient management point of view is the boiler plant. High priced engineers are employed to look after the mechanical details and every facility is furnished to maintain the equipment at maximum efficiency, but the boiler room is left to the fireman, and beyond a steam gage, few means of knowing what is happening are available.

The only item aside from its by-products a central heating plant has for sale is the coal pile in the form of steam, and the only item it must compete with is the coal pile. The sale price of the commodity is therefore based on the cost of the coal to the consumers and this should be the base in arriving at a price schedule. If an increment rate is to be selected the various steps should be based on the cost of the different kinds of coal which would be used and the quantity in which it is purchased. A residence consumer buys hard coal in retail quantities, and this establishes the high rate in the schedule, while the large office buildings with ample coal storage capacity and burning soft coal, purchase in wholesale quantities and establish the low rate on the schedule. Naturally, to the price of coal must be added investment charge of the private heating plant, the value of the space used, the labor and all other incidental charges which make up the total cost of the private heating plant service, but all these items are only a small percentage of the cost of the coal.

It is therefore apparent that as the service must be sold at a rate so closely governed by the cost of coal, the profit must be made by the careful purchase not only at the right price, but also of the right quality of coal to be used by the central heating plant. This item naturally becomes an important one in the relative difference in cost between that paid by the consumer and that paid by the central station, and should represent

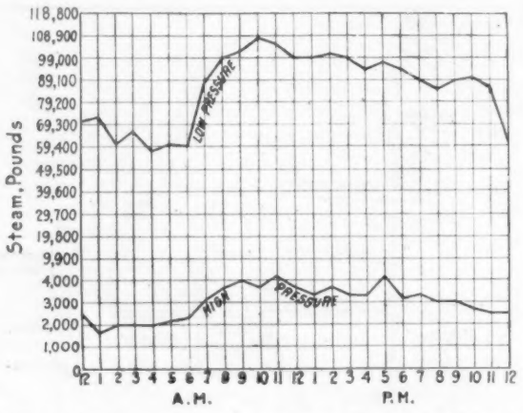


FIG. 3—DEMAND CURVES FOR LOW AND HIGH PRESSURE STEAM SYSTEMS FOR TYPICAL WINTER DAY

the largest percentage of the various items which make up the net profit. For small consumers this will naturally be very material as hard coal will cost from $6 to $8 per ton, as against the central station's cost of $3 per ton. For large consumers the difference is very small, they probably paying $3.50 per ton for soft coal as against the $3 cost of the central station, which is somewhat increased by the care with which the central station buys its coal as against that of the average office building, and when compared on a B.t.u. basis there should be a very satisfactory difference.

The next item of profit is the difference in economy with which the coal can be burned by the central station plant as against the private plant and it is here that the most important opportunities for efficient operation exist and every means should be provided to locate any losses in order to obtain the highest efficiency of the boiler. Not only must this show a sufficient economy over the private plant boiler to warrant a profit, but it must also be of sufficiently higher efficiency to offset the possible losses in the steam mains.

It is therefore apparent that the evaporation per pound of coal in the central station plant, including the losses in delivering the service, must be higher than the evaporation per pound of coal in an isolated plant before this item can be entered as one of the items making up the net profit. To emphasize the importance of maintaining fixed charges as low as possible the net income of operation from this plant was approximately as follows for the twelve months covering a fiscal year from May 1:

Month	Losses	Month	Profit
May	$751	November	$1,308
June	1,842	December	4,754
July	1,576	January	3,997
August	1,738	February	4,207
September	1,799	March	3,993
October	1,141	April	1,500
Total for year	$8,847	Total for year	$19,759
Net profit from operation			$10,912

To reduce the losses during the non-heating months an effective canvass for high pressure steam service should be made and it is surprising how easily consumers representing a gross income of from $30 to $100 per month can be obtained for this service. Lunch rooms make attractive prospects, both for hot water, dishwashing and live steam service for coffee urns. Also, hot water for scrubbing and cleaning in theaters and buildings not regularly supplied with this service during the summer months can be furnished at a cost attractive to such consumers. For barber shops it can also be shown to be less expensive than either gas heaters or small boilers.

In arriving at the proper rate for this company, it was found that with the prices of coal in Milwaukee, the following schedule would make it profitable for any consumer to purchase heat in preference to installing his own heating plant or facilities for heating hot water.

LOW PRESSURE STEAM

First 25,000 lb. of condensed steam used in 1 month	$0.80 per 1000 lb.
Next 25,000 lb. of condensed steam used in 1 month	.70 per 1000 lb.
Next 25,000 lb. of condensed steam used in 1 month	.60 per 1000 lb.
Next 25,000 lb. of condensed steam used in 1 month	.50 per 1000 lb.
All over the above amount of steam used in 1 month	.45 per 1000 lb.

HIGH PRESSURE STEAM

First 25,000 lb. of steam used in one month	$1.00 per 1000 lb.
Next 25,000 lb. of steam used in one month	.90 per 1000 lb.
Next 25,000 lb. of steam used in one month	.80 per 1000 lb.
All over 75,000 lb. of steam used in one month	.70 per 1000 lb.

STATISTICS FOR THE YEAR ENDING MAY 1

Total pounds steam generated	152,259,921
Pounds high pressure steam sold	20,070,177
Pounds low-pressure steam sold	101,092,032
Pounds coal consumed per 1000 lb. steam generated	142.2
Pounds water evaporated per pound coal consumed	7.03
Average losses, per cent	25.3
Average cost steam generating, expenses per 1000 lb. sold	$0.403
Average cost distributing expenses per 1000 lb. sold	.029
Average cost consumption expenses per 1000 lb. sold	.0214
Average cost fixed charges on entire plant per 1000 lb. sold	.102
Average cost miscellaneous expenses per 1000 lb. sold	.051
Total operating expenses per 1000 lb. sold	.606
Average gross income per 1000 lb. steam sold (including income from by-products)	.687
Average income from by-products per 1000 lb. sold	.197
Net income from steam heating business per 1000 lb. sold	.081

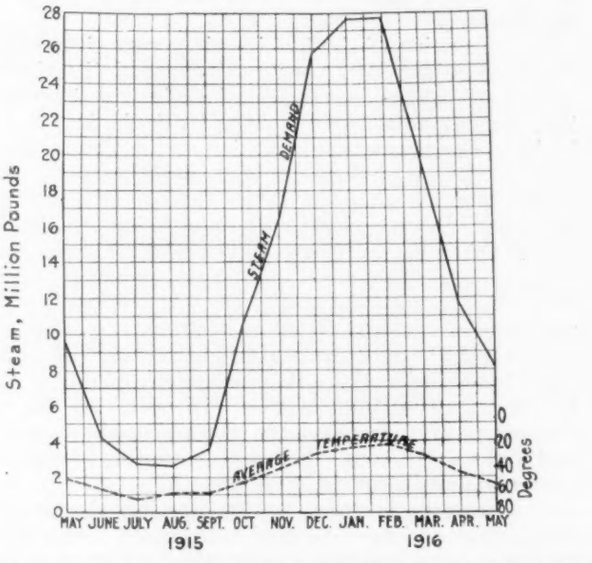


FIG. 4—MONTHLY OUTPUTS OF BOTH HIGH AND LOW PRESSURE STEAM AND AVERAGE TEMPERATURE FOR EACH MONTH. MAXIMUM TEMPERATURE 16 DEG. FAHR., MINIMUM 11 DEG. FAHR.

The capacity of Commonwealth Power Company's plant is about 80 per cent sold. It is expected that during the coming season the other 20 per cent will be disposed of, at which time the maximum earning capacity of the investment will be obtained. From the favorable showing made during the past two years this property will average a net income at least equal to that of the average electric lighting utility.

Rural Service From Iowa Transmission Lines

Analysis of Five Methods of Supplying Energy to Iowa Farmers, Giving Division of Investment, Rates for Service and Revenue, with Recommendations

RURAL business from transmission lines was discussed at length in a committee report presented at the recent annual meeting of the Iowa section, National Electric Light Association, by W. H. Burtis and F. D. Paine. The status of rural service in Iowa was summarized in a chart which is reproduced herewith. In compiling this information the companies serving farmers were divided into five classes: (1) Those serving farmers directly from high-tension lines built to other towns by stepping the voltage down directly to 110 volts. (2) Those serving farmers from similar lines by stepping the voltage down to 2200 volts for distribution among farms, and again reducing the voltage to 110 volts for service. (3) Those operating high-tension lines to serve farmers only, and stepping the voltage down directly to 110 volts. (4) Those operating similar lines, and stepping the voltage down to 2300 for distribution among farms, and then again reducing it to 110 volts for service. (5) Those serving farmers from 2200-volt extended city lines.

From a summary of the information in this chart it may be seen that the fifty-two companies who sent in reports to the committee have a total of 571 rural customers. The maximum number of customers per company is eighty and the minimum is one. Twenty of the fifty-two companies furnish rural service to 179 customers from lines operating at 6600 volts or higher. Of these companies, eleven use 6600-volt equipment, and serve ninety-six customers; seven transmit energy at 13,200 volts, and serve sixty customers; one operates at 16,500 volts, and serves five customers; an another one uses 33,000-volt equipment, and serves eighteen customers. Classifying these companies on a different basis, it may be seen that seventeen serve 155 customers from the high-tension lines built to other towns, and step the voltage down to 110/220 directly. Ten of these companies employ a high-tension pressure of 6600 volts, and serve ninety-eight customers, while the remaining seven use a high-tension pressure of 13,200 volts and serve fifty-seven customers. Four companies serve thirty customers from their high-tension lines to other towns, first stepping the voltage down to 2300 volts for distribution. The investigation shows that in the State of Iowa only two companies have built lines to serve farmers only, and that these companies are using 6600-volt equipment and serving only ten or twelve customers.

At the 1915 Iowa convention there was considerable discussion as to whether or not farmers should incorporate and buy energy at wholesale, measuring it with one meter. Evidently there have not been many developments along this line, since there are only two instances reported where farmers have incorporated. In these particular cases a 2300-volt line was built out from the town by the farmers and the energy measured at the city limits. It is interesting to note, however, that ten companies recommend such an incorporation.

From its study the committee has concluded it to be imperative that the rate given for rural service be higher than that for the same service within the city limits. Furthermore, a greater investment is required per rural customer and per kilowatt-hour of consumption, and less consumption exists per kilowatt of connected load than is indicated by the data compiled by the Wisconsin Railroad Commission on this subject. Again, there is a greater maintenance and depreciation charge per customer and per kilowatt-hour of consumption due to greater exposure of the transformers and apparatus to lightning. The labor charge is also greater, due to more frequent calls for fusing and for working upon burned out or damaged transformers, which is, of course, more costly because of the distance from the central station. In addition, the investment, maintenance and trouble charges are greatest where the transformers are isolated and upon high-tension lines, maintenance charges being increased practically in proportion to the length of the lines. Since a ground occurring at a great distance from a small high-tension transformer may cause surges which will damage the transformer and frequently burn off the high-tension leads, or even burn out the transformer, another source of interruption to service other than lightning is introduced when it is found necessary to operate long lines.

PROTECTING RURAL-SERVICE EQUIPMENT

Greater attention must be paid to the condition of transformers on rural lines than on city lines, since primary and secondary coils are more liable to become crossed because of the abnormal voltages which are set up on such lines. Fuses of the expulsion type should be used for the protection of such transformers, and great care exercised to see that the capacity of the fuse is kept down to the lowest possible limit. For further precaution the transformer case and the secondary or 110-volt line should be thoroughly grounded to make the installation safe. The transformers should also be provided with as good lightning protection as the installation will warrant, which in most cases cannot be more than a simple form of horn-gap arrester. Furthermore, each transformer with its protecting apparatus should not be mounted on a line pole, but on a separate pole a little distance from the line. Even with such protection the committee believes that the loss due to burning out will be greater on country transformers than on transformers within the cities. This trouble and consequent expense is proportional to the voltage employed and the length of the line.

From experiences related by several companies the committee has concluded that rural service cannot be furnished very profitably by installing a number of isolated high-tension transformers upon a main trunk line to cities, especially since the cost of interruptions to service is likely to more than offset the possible profit from such business. This risk, it was pointed out, may be greatly reduced by inserting one step-down transformer instead of several, and distributing at 1100 or 2200 volts to a number of farm transformers. This method is practical, provided the construction of lines and determination of rates are given due consideration. In utilizing this method of 2200-volt distribution, or extending the 2200-volt city lines, it is considered a good plan, when it can be arranged, to have the farmers incorporate and pay for the energy as measured by a totalizing meter instead of by several meters. The cost of such a line to the farmers, using a 2200-volt single-phase line on 30-ft. poles, with No. 8 wire, could be kept down in most locations to about $400 per mile when the price of copper is normal. If four farmers were served per mile, this would entail a cost of $100 each for the line, to which must be added $50 for a transformer and

secondaries to his house. Under these conditions he would still have a much lower investment than that necessary for a private plant.

CONCLUSIONS FOR IOWA CONDITIONS

Referring to the two classes of service mentioned in the opening paragraph as 3 and 4, the committee concluded it would be impractical to build high-tension lines especially for the purpose of serving the farmers except possibly in very unusual cases, because the cost of the extension and operation of the line would make it prohibitive. In any class of service here considered, the rural extension should be paid for by the farmer or the group of farmers desiring the service, since this is the only way in which a uniform rate can be made to apply to all customers. A proper rate would be one in which the demand charge is made proportional to the size of the transformer from which the service is given, and an additional charge per kilowatt-hour at the same rate as for the same class of city service.

From overhead expenses chargeable to individual transformers it seems reasonable that the demand charge on an extended 2200-volt city line, Class 5, should not be less than $1 per month for a 1-kw. transformer, $1.50 per month per kilowatt-hour of rating for a 3-kw. transformer, and $2 per month for a 5-kw. transformer. With Class 2 distribution the demand charge should be higher per kilowatt of transformer rating than in Class 5, and should be calculated for any installation according to its cost and other variable factors. For Class 1 service the demand charge should be not less than $3 per month for a 3-kw. transformer and $4 per month for a 5-kw. transformer. The minimum charge should be as follows for service to Classes 1, 2 or 5:

Transformer Rating (Kw.)	Monthly Minimum Charge
1	$2.50
2	3.00
3	4.00
5	5.00

The committee summarized its report as follows: The farmer should pay for the rural service lines. These should be maintained and owned by the power company under its own franchise. The transformers and protective apparatus should preferably be furnished by the power company. The rate charged should be sufficient to cover the additional cost of giving such service.

TABLE I—METHODS OF SUPPLYING IOWA RURAL SERVICE AND DIVIDING EXPENSES, RATES AND AVERAGE BILLS

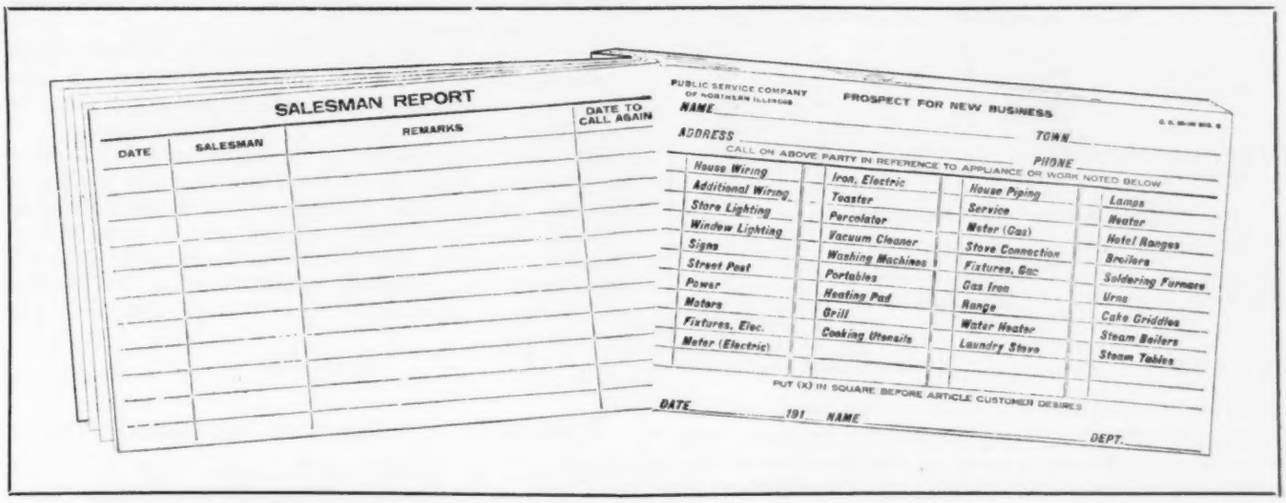
No	Town	Number of Customers¶¶	System Served from—High-Tension Voltage				Construction Paid for by Farmer		Maintenance Paid for by Farmer	Lines Owned By	Rates								Monthly Average Bill or Consumption	
											City				Rural					
			*1	†2	‡3	§5	Transformer	Line			Light, Cents	Power, Cents	Minimum Light	Minimum Power	Light, Cents	Power, Cents	Minimum Light	Minimum Power	Light	Power
1	Adel	20 5	6,600	....	....	2,200	Yes	Yes	No	Company	14–7	10–3	$0.75	$1.00 hp.	7	7	$5.00	.....	$16.00	$16.00
2	Ames	3	....	....	....	2,200	Yes	Yes	Yes	.....	11–5.5	6–3.5	1.00	1.00 hp.	¶Same	¶Same	¶Same	¶Same	.....	.....
3	Atlantic	8	....	....	....	2,200	Yes	Yes	No	Farmer	10–6	7.5–2	1.00	.....	Same	Same	Same	.....	1.50	2.00
4	Eldora	6 10	16,500	....	....	2,300	Yes	Yes	No	.....	10–6	8–4	1.00	0.50 hp.	14–8	8	$12.50 quar.	$0.50 hp.	.....	.....
5	Esterville	8	....	....	....	2,300	Yes	Yes	Yes	.....	11	7	0.90	.....	Same	Same	Same	.....	.....	.....
6	Glidden	18 6,600	....	....	....	2,300	Yes	Yes	Yes	.....	15–8	9–5	1.00	.....	Same	Same	Same	.....	.....	.....
7	Guthrie Center	1	....	....	....	2,200	No	No	No	.....	15–10	8–5	None	.....	Same	Same	Same	.....	.....	.....
8	Hawarden	10	....	....	....	2,300	Yes	Yes	Yes	.....	.....	.....	1.25	.....	Same	Same	Same	.....	.....	.....
9	La Porte City	2	....	....	....	2,300	.....	.....	.....	.....	15–11	7	0.75	1.00 hp.	Same	Same	Same	Same	16-kw. hr. 3	.....
10	Leon	15	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	Lisbon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	Malvern	6 24	10,000	....	6,600	....	No	Jointly	No	Company	15–9	6	0.75	10.00 hp.-yr.	Same	Same	$50 year	Same	.....	.....
13	Mechanicsville	4	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	Mt. Vernon	5	....	6,500	....	....	No	No	No	.....	12.5–8	6.5–4	None	.....	Same	Same	$4.00	.....	35 kw.-hr.	125 kw.-hr
15	NewHampton	5	....	....	....	1,150	Yes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	Nora Springs	3	13,200	....	....	....	Yes	Yes	Yes	Company	12–10	6	0.75	0.75 hp.	Same	Same	2 00	.....	1o kw.-hr.	20 kw.-hr. per hp.
17	Orange City	....	....	....	....	1,100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	Osceola	....	6,600	....	....	....	No	No	No	.....	12	10	0.75	1.00 hp.	Same	Same	Same	Same	15 kw.-hr.	75 kw.-hr
19	Panora	17	....	....	....	2,300	Yes	No	No	.....	12.5	.....	.....	.....	Same	.....	Same	.....	.....	.....
20	Peterson	30	13,200 6,600	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$50 per year	.....	.....	.....
21	Rockford	1	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
22	Rock Valley	6	6,600	....	....	....	Yes	No	.....	.....	15–10	7–5	1.25	1.00 hp.	Same	Same	$1.75	$1.00	45 kw.-hr.	None
23	Sanborn	....	6,600	....	6,600	....	Yes	Yes	Yes	.....	15–10	8.5–4.5	0.50	1.00 hp.	Same	Same	Same	Same	.....	.....
24	Scranton	12	6,600	....	....	....	Yes	Yes	Yes	.....	.....	.....	1.00	.....	Same	Same	Same	.....	20 kw.-hr.	.....
25	Sheldon	14	....	....	....	2,200	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	Spencer	2	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	Springville	15	....	....	....	2,300	No	No	No	.....	15–10	.....	1.20	.....	Same	.....	Same	.....	10 kw.-hr.	.....
28	State Center	5	....	....	....	....	Yes	Yes	Yes	.....	15–5	.....	1.00	.....	Same	Same	Same	.....	24 kw.-hr.	.....
29	Story City	7	6,600	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	Sumner	3	13,200	....	....	....	No	No	No	.....	15–8	10–5	1.00	0 50 hp.	Same	Same	$5.00	.....	25 kw.-hr.	.....
31	Waverly	6	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
32	Webster City	7	....	....	....	2,400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
33	Wayland	4	....	....	....	2,200	Yes	Yes	Yes	.....	15	10	1.00	.....	8	8	.....	.....	50 kw.-hr.	70 kw.-hr.
34	Waterloo	....	....	44,000	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
35	Cedar Rapids	....	....	....	....	2,300	No	No	No	.....	11–5	9–2.5	0.75	1 50 hp.	Same	Same	Same	Same	$1.50	.....
36	Davenport	....	....	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
37	Des Moines	6	6,600	....	....	....	Yes	No	No	.....	.....	.....	1.00	.....	15	.....	Same	.....	32 kw.-hr.	.....
38	Eagle Grove	80	....	....	....	2,500	Yes	Yes	Partly	Farmer	13–11	Varies	0.75	.....	Same	.....	Same	Same	.....	.....
39	Greene	3	....	....	....	110	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	Grinnell	4	13,200	....	....	....	No	No	No	.....	12–10	7–5	1.00	.....	Same	Same	$3.00	$1 hp.	.....	.....
41	Grundy Center	24	....	....	....	3,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
42	Hamburg	5	....	6,600	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
43	Jefferson	3	....	....	....	2,200	No	No	No	.....	8	.....	0.40	0.60 hp.	8	.....	2.50	$2.50	.....	.....
44	Lamoni	13	6,600	....	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
45	Mason City	4	13,200	....	....	....	No	No	No	.....	12–4	.....	.....	.....	12–9	.....	.....	.....	.....	.....
46	Muscatine	18 3	....	33,000	....	2,200	Yes	Yes	No	.....	15	.....	1.00	.....	Same	.....	4.00	.....	22 kw.-hr.	15 kw.-hr.
47	Nevada	2	....	....	....	2,300	Yes	Yes	Yes	.....	13–8	8–3	1.00	1.00 hp.	Same	Same	Same	.....	17 kw.-hr.	45 kw.-hr.
48	Sac City	6	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
49	Sigourney	7 28	13,200	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
50	Red Oak	4	....	....	....	2,300	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
51	West Union	.....	.....	.....	.....	.....	No	Yes	.....	.....	.....	.....	.....	.....	10	.....	$5.00	.....	.....	.....
52	Decorah	22 2	13,200	13,200	....	....	Yes	Yes	No	Company	.....	.....	1.00	0.50 hp.	Sam e	Same	5.00	.....	$5.80-36 kw.-hr.	.....

*Transmission lines to other towns—voltage stepped down directly to 110 volts. †Transmission lines to other towns—voltage stepped down to 2300 for distribution. ‡Transmission lines for rural service only—voltage stepped down directly to 110 volts. §City lines extended. ¶Means same as city. ¶¶Where more than one number appears in the column headed Number of Customers it means that the consumers are served from different-voltage lines, the corresponding pressures being indicated in the same relative positions in the next column. For instance, in Adel (line 1) twenty customers are served from 6600-volt lines and five from 2200-volt circuits.

Making a Commercial Scout of Every Employee

A Co-operative Plan for Enlisting the Active Assistance of All Company Employees in Furthering the Work of the Commercial Department

BY JOHN G. LEARNED
Assistant to the Vice-President, Public Service Company of Northern Illinois



EVERY EMPLOYEE OF THE COMPANY RECEIVES ONE OF THESE BOOKS OF "PROSPECT CARDS" ON WHICH HE ENTERS THE NAMES OF PROSPECTIVE CUSTOMERS AND REPORTS THE CHARACTER OF SERVICE IN WHICH THEY ARE LIKELY TO BE INTERESTED

THE matter of employees' co-operation is often made more or less abstract and idealized. Confronting the central station is the problem of formulating a plan of co-operation which will be of interest to all employees and which will result in systematized effort. In an organization such as the Public Service Company of Northern Illinois, supplying a large number of cities, towns and villages, it is sometimes rather difficult to keep enthusiasm in each and every employee at white heat. We have about 1700 employees, all of whom are interested in promoting the company's welfare for their mutual benefit. The contract department itself numbers sixty-two active, energetic salesmen. It was seen long ago, however, that the other employees represented wonderful sales force possibilities, if they could all be actively interested in the sales work. Consequently a plan has been worked out to give the interest of all employees in sales work an outlet.

The "Prospect for New Business" card is a part of our plan which has proved very successful. Every employee is provided with a book of these prospect cards, as illustrated herewith.

When this plan of co-operation was started an explanatory letter was sent to all employees. This letter was headed "Co-operation Is the Keynote of Success," and read as follows:

"In recognition of past co-operation of all employees, and with a view to inviting even closer co-operation if possible in the future, a monthly bonus is offered in the form of three awards:

"First Prize—$10 in gold.
"Second Prize—$5 in gold.
"Third Prize—$3 in silver.

"The inclosed book of 'Prospect for New Business' cards is for your use. Fill them out in duplicate; turn in one copy to your district superintendent and send the other copy to the Contract Department, Room 1310, 72 West Adams Street, Chicago.

"Business secured from 'Prospect for New Business' cards will be credited in accordance with the point system shown on the attached sheet. The employee receiving the largest number of points during each month will be awarded the first bonus; the next largest the second bonus, and the third largest the third bonus. In the event of a tie, the bonus will be divided.

"The prospects will be followed up by the contract department in the district and also from the General Office.

"You should make a practice of checking up your prospects to make sure they are closed at the earliest possible date.

"Salesmen in the contract department are not eligible to participate in the awards."

POINT SYSTEM FOR AWARDING CREDIT TO CO-OPERATING EMPLOYEES

No credit is given "Prospect for New Business" cards, in case the names of the same prospects appear on the salesman's reports within thirty days prior to the date shown on the card.

Points are awarded in accordance with the following table:

POINT SYSTEM USED IN DETERMINING WINNERS OF BONUS AWARDS

Electric	Points	Gas	Points
House wiring	100	Additional piping	10
Additional wiring	10	House piping	100
Store lighting	50	Service	5
Window lighting	50	Meter (gas)	10
Signs	50	Stove connection	5
Street post	50	Per $1 fixtures	1
Power per horsepower	50	Gas iron	25
Per $1 fixtures	1	Range	50
Meter (electric)	10	Automatic water heater	200
Electric iron	25	Laundry stove	25
Toaster	25	Tank heater	50
Percolator	25	Lamps	10
Vacuum cleaner	20	Heater	25
Washing machines	20	Hotel ranges	200
Portables	5	Broilers	50
Heating pad	10	Soldering furnaces	25
Grill	10	Urns	50
Cooking utensils	10	Cake griddles	25
Radiators	25	Steam boilers	50
Heaters	25	Steam tables	75

CONTRACT DEPARTMENT MIRROR

-SEE WHAT HAS BEEN DONE-

PROSPECT FOR NEW BUSINESS

MAY AWARDS, 1915.

THE WINNERS:

Name	Dept.	Dist.	Town	Rank	Points	
MISS B. HUEBNER	Repair	C	EVANSTON	1	2865	$10
E. J. MILLS	Wiring	J	JOLIET	2	2300	5
MISS ETHEL FERGERSON	Cashier	O	MORRIS	3	238	3

The following are entitles to honorable mention:

J. Ingram	Sales	D	Oak Park	4	815
H. Rapp	Store	K	Crystal Lake	5	686
J. Westerhoff	Construction	K	Kankakee	6	460
Chris Biesenger	Wiring	D	Oak Park	7	400
H. A. Kraft	Collection	D	Oak Park	8	365
W. H. Krutz	Inspection	F	Chicago Hts.	9	280
C. A. Stewart	Stores	K	Crystal Lake	10	268
A. Linde	Street	D	Oak Park	11	245
Miss K. Miller	Sales	D	Oak Park	12	220
C. J. Hebner	Street	D	Oak Park	13	210

Our ladies are to be congratulated!

Assistant to Vice President

THE NAMES OF THE EMPLOYEES WHO MAKE THE BEST RECORD ARE PUBLISHED EACH MONTH IN THE SALES-DEPARTMENT "MIRROR," A MIMEOGRAPHED SHEET DISTRIBUTED AMONG THE COMPANY'S OFFICES

The letter reproduced on the preceding page excited the interest and aroused the enthusiasm of all employees at the beginning of the campaign. To continue this spirit a monthly report, known as the *Contract Department Mirror* is issued on mimeograph sheets and a copy is handed each employee with his pay check. The copy of the *Mirror* reproduced herewith shows how, through suggestion, even the women employees of the company have been encouraged to win awards and a strong position in the honorable mention list.

To stimulate interest further, this co-operative effort is frequently discussed at sales meetings. Each salesman is impressed with the fact that he may save himself much tiring and unproductive effort if he will induce all of the employees he comes in contact with to turn in "Prospect for New Business" cards. At general district meetings where all employees, as well as their wives, are present, the bonus award is discussed and explained. In fact, every opportunity is taken to make all employees see the importance of the campaign and realize that through participation in it there is offered a chance of betterment for everyone which is far greater than the immediate pecuniary return or the favorable publicity of the Honorable Mention column of the *Mirror*.

AMOUNT OF BUSINESS SECURED FROM "PROSPECT FOR NEW BUSINESS" CARD DURING MONTH OF APRIL, 1915

	Electric		
District	Kilowatts	Fixtures, Wiring, Appliances—Amount	Gas Appliances—Amount
A	16.27	$761.98	.....
B	1.40	76.04	.....
C	4.40	365.50	.....
D	17.38	409.30	$442.85
E	20.88	.....	58.00
F	6.44	61.90	237.45
G	....	.....	.....
J	1.95	112.00	.....
K	1.00	7.00	.....
L	....	.....	.....
O	1.25	45.50	6.00
R	1.00	61.91	284.30
S	10.65	735.54	.....
Total	82.62	$2,636.67	$1,028.60

The campaign has been in operation since Jan. 1, 1915. On the average the employees of the company, outside the sales department, have turned in 400 prospective customers per month. From this list of prospects an average of 350 customers per month has been secured. Taking the records for the month of April, 1915, as typical, it is apparent that 82.62 kw. of electric load was added to the company's lines, $2,638.67 worth of wiring, fixtures and electric appliances were sold, and $1,028.60 worth of gas appliances were sold as the result of the co-operative efforts of the employees outside the contract department.

The cost to the company outside of the $18 per month required for the prizes, is almost negligible. In fact, the total cost inclusive of all details will not amount to more than $25 per month.

One important feature of this plan is that it brings to light sales talent that otherwise we would not know existed. Men in other departments, such as the wiring division, have sometimes displayed such unusual ability in selling that they have been sought out by the contract department and given an opportunity on the regular selling force. It is gratifying to know that they are making good.

Electrolytic Chlorine for Laundries

Production of Bleaching Solution from Salt and Water, to Replace Bleach Powders Now Advanced in Price

BY H. P. HILL

For several years a number of the larger laundries have prepared their own bleaching material by the electrolysis of salt solution, finding it cheaper to produce their own "bleach" than to purchase the bleaching compounds which were largely manufactured abroad and exported to this country. In recent months, however, the sharp advance in the prices of bleaching compounds of all kinds has made it increasingly desirable for even smaller laundries to produce their own chlorine solutions by the electrolysis of salt and water.

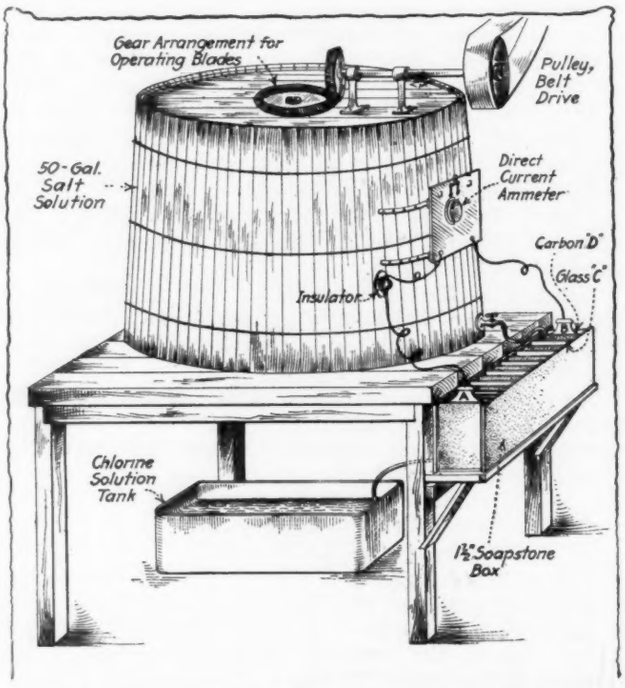


FIG. 1—ELECTROLYTIC CHLORINE TANK FOR PRODUCING BLEACHING SOLUTION FROM SALT AND WATER

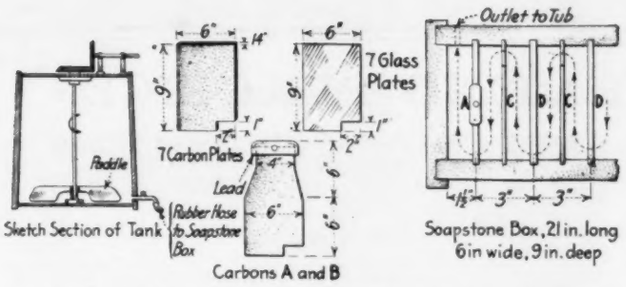


FIG. 2—DETAILS OF TANK AND ELECTROLYTIC CHAMBER

The electrolytic load thus afforded the central station is comparatively long-hour in character, and may be arranged so as to fall entirely during the daylight hours. In the following paragraphs are given descriptions of typical equipment for the production of chlorine for laundries and other industries, including the reclamation of tin from old cans.

CONSTRUCTION OF 50-GAL. OUTFIT

Fig. 1 shows a 50-gal. outfit, which requires 25 amp. of direct current at 110 volts. The equipment, as shown in the sketch, comprises a 50-gal. wood tub mounted on a stand 3 ft. above the floor, and filled with a solution of common salt and water. In the center of the tub is a shaft on which is mounted a blade or paddle which slowly revolves in the tub to agitate and dissolve the salt. On the side of the tub is mounted a soapstone box containing the electrodes. This box measures 22 in. long, 9 in. wide and 6 in. deep. At each end are placed the carbon-block electrodes *A* and *B*, and spaced at 3-in. intervals are alternate glass and carbon plates *C* and *D*. Each plate has a 1-in. square "bite" taken out of one corner. The object of these baffles or plates is to diminish the flow and keep the solution in contact with the current, through a longer path. The salt water from the tub is admitted at the negative element, and is discharged at the positive element. From the discharge end chlorine solution flows into a tub on the floor, from which it is dipped and used in the washing machine. This solution is known as "chick" or bleaching compound.

The form of apparatus just described can be improved in efficiency by modifying the design of the soapstone box, as shown in Fig. 3. The top of the box shown in this sketch is covered, and the chlorine gas generated instead of being allowed to escape in the air is piped to the bottom of the salt tub, or can be carried in pipes to a bleaching or drying room, where it is of value. Another advantage of confining the chlorine gas as in Fig. 3, by closing the top of the salt tank, is that the amount of the gas given off will determine the feed or overflow of the chlorine discharge from the positive side of the box, and insure a solution of maximum strength at all times.

OTHER USES FOR CHLORINE PRODUCTS

Another use for this form of apparatus is that of removing the tin from old cans, etc. A brick retort is built with proper means of heating the metal up to the proper temperature, and the solution of chlorine gas coming in contact with the heated metal attacks the tin.

A novel form of a chlorine generator used as a disinfector or purifier is shown in Fig. 4. In this type the apparatus is automatic and the current automatically cuts itself off when a supply of chlorine is made. The outfit can be adjusted to feed as little gas as required, the supply and discharge being regulated by the gas pressure in the generator. The bottle, usually 1

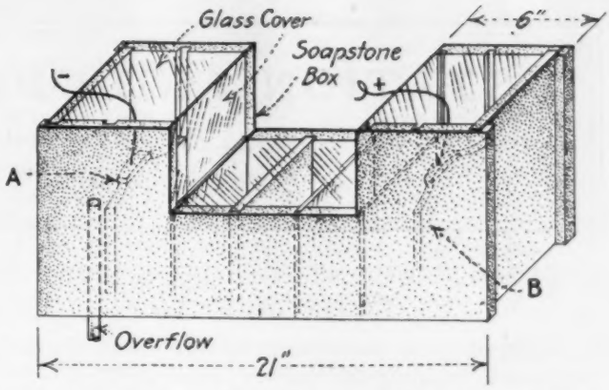


FIG. 3—CLOSED ELECTROLYTIC CHAMBER FOR COLLECTING CHLORINE GAS

gal. in size, is filled with a saturated solution of salt water, and is inverted over the glass or earthenware crock, which a gasket makes airtight. The glass tube extends to within approximately 1 in. of the bottom of the crock.

FOR MAKING CHLORINE IN SMALL QUANTITIES

The tube measures 3 in. in diameter and is sealed into the top so as to be gastight. On an iron rod is clamped the positive carbon, which is connected in series with a 32-cp. incandescent lamp. In the U-bend discharge pipe is a valve which is adjusted for the proper discharge. When the bottle is filled with the saturated salt solution, and the current is turned on, chlorine gas is formed inside the 3-in. glass tube. This gas drives the solution down in the tube until the circuit is interrupted at the bottom of the electrode. If the valve in the outlet pipe is closed or set for a small discharge, this gas will condense, and allow the solution to rise in the tube, re-establishing the circuit and so generating more chlorine. As the chlorine is discharged through the U-tube new solution is allowed to feed down from the bottle, and the apparatus automatically makes the amount of chlorine within its capacity as required.

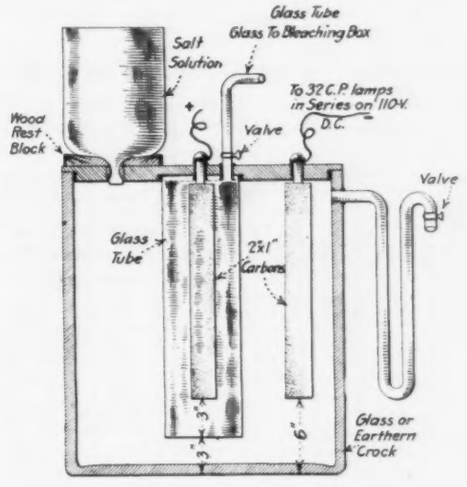


FIG. 4—APPARATUS FOR PRODUCING CHLORINE SOLUTION IN SMALL QUANTITIES

A glass tube can be extended through the cover into the large glass tube, obtaining directly a supply of chlorine gas for bleaching purposes. This apparatus provides a ready means of securing chlorine solution or chlorine gas in small quantities at little expense. It has a wide field as a disinfectant or purifier, and is applicable to many industrial uses.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

AUTOMATIC CONTROL OF 75 KVA HYDROELECTRIC PLANT

Arrangements for Automatically Indicating Trouble and Stopping Machinery in an Attendantless (N.C.) Station

BY D. R. SHEARER

In the June 24 issue of the ELECTRICAL WORLD, page 1454, appeared a description of a 75-kva. hydroelectric plant at Boone, N. C., which operates without an attendant. Automatic arrangements were mentioned which, in case trouble develops or abnormal operating conditions arise, cause the plant to stop itself and ring a large gong outside the building. This gong rings until the trouble is removed. The station is in charge of a mechanic in a near-by mill who is within hearing of the gong and responds to its call.

The plant switchboard and a special annunciator board referred to in the article mentioned are shown in Fig. 3. The connections for the operating mechanisms are shown in Fig. 1. The annunciator board has five drops and indicates the origin of any trouble that causes the bell to sound. The drops show the following troubles: 1. Frayed or broken ropes or belts or tension carriage at the end of track. 2. One or more hot bearings or overloaded generator. All bearings and generator are equipped with thermostats. 3. Speed above or below normal, indication from governor. 4. Automatic oil switch tripped. 5. Voltage above or below normal.

The operation of this power plant alarm system is as follows: The current for its operation is normally taken from a shunted Nichrome resistance on the exciter buses. However, after the exciter has stopped a relay shifts the alarm circuit to a storage battery of low voltage which is kept fully charged from the same resistance. An automatic battery cutout is placed on the battery to prevent the current backing through the resistance when the plant is not running. This battery also supplies a low-voltage lamp circuit for emergency use in case of break-down. The regular lighting circuit can be fed from the exciter or from the alternating current supply.

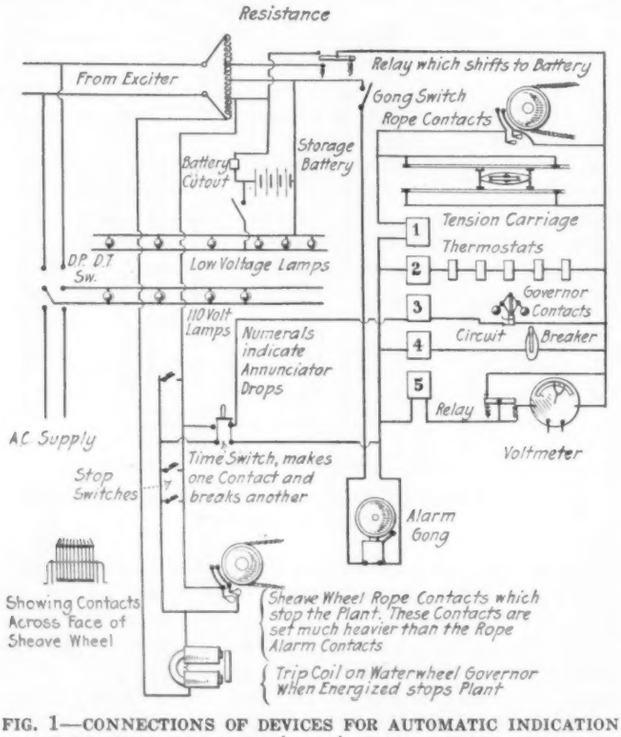


FIG. 1—CONNECTIONS OF DEVICES FOR AUTOMATIC INDICATION OF TROUBLE IN BOONE (N. C.) HYDROELECTRIC PLANT

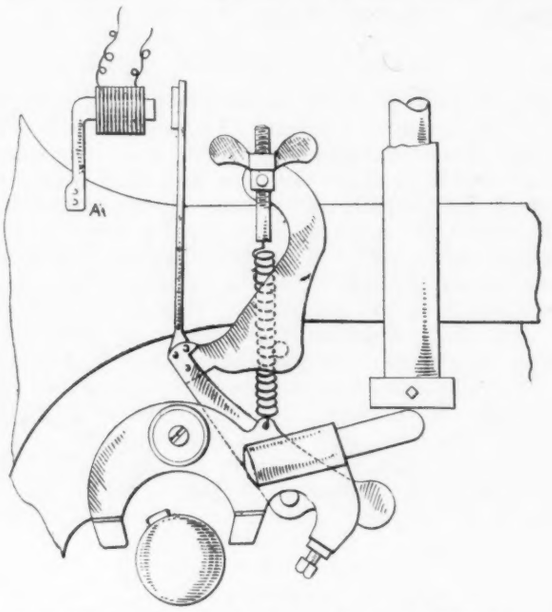


FIG. 2—METHOD OF ATTACHING TRIP COIL TO SAFETY TRIP OF COMPENSATING MECHANICAL GOVERNOR

Trouble with the rope drive, belting or tension carriage operates annunciator drop No. 1 and the large alarm gong. The tension carriage track has contacts at each end so that over-travel is prevented. These contacts are operated by the carriage wheels about 6 in. before the track limits are reached. A light bar is placed across each sheave wheel clearing the ropes about ¼ in., and just back of this bar is a contact also on drop No. 1 so that a raveled or frayed rope furnishes an immediate indication. On one of the sheave wheels a much larger and heavier contact system is placed, which is not connected to the alarm wiring but to the stop circuit. Frayed yarns do not affect this contact, but should the rope break the trip circuit is closed and the plant stopped at once.

The thermostats on the bearings and machinery operate drop No. 2. Drop No. 3 is energized by contacts on the governor at more or less than normal speed. This circuit is carried through the time switch so that when the plant is closed down at midnight and the governor comes to rest the gong will not continue to ring. The time switch opens the alarm circuit at the same time that it closes the trip-coil contact. The automatic oil switch has a contact placed on it in the open position and throws drop No. 4 when knocked out by shorts or other causes. The voltmeter closes contacts through a relay at either high or low voltage and operates drop No. 5. This circuit is merely to operate should the Tir-

rill regulator fail to hold voltage to reasonable limits.

The method of attaching a trip coil to a Woodward Type D compensating governor is shown in Fig. 2. The trip coil is a double-pole, horseshoe type. The part

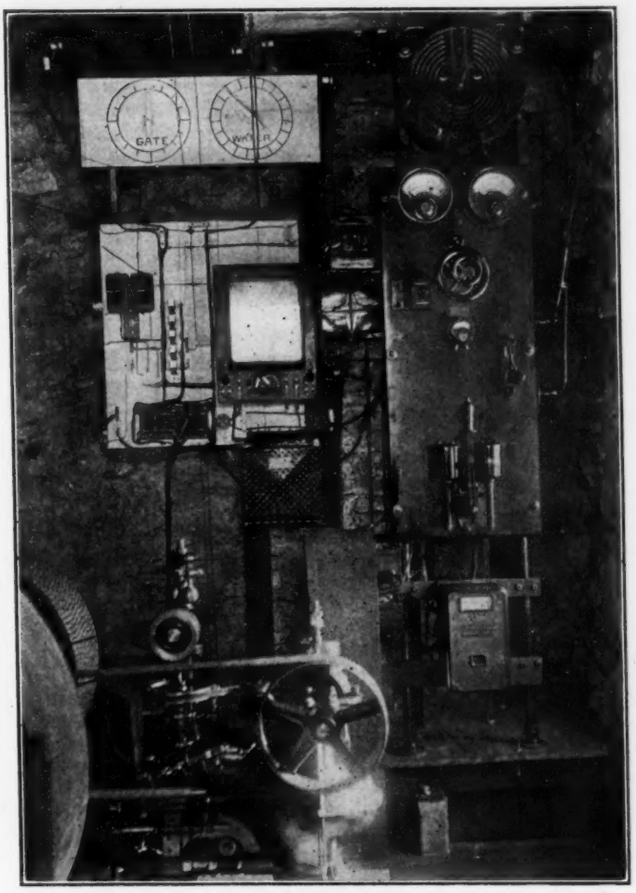


FIG. 3—CONTROL BOARD SHOWING ANNUNCIATOR THAT INDICATES STATION TROUBLE AND THE GATE OPENING AND WATER LEVEL INDICATORS

marked A and its armature are the features added. When the coil is energized by the time switch by any of the electrical stop contacts or by manually operated push buttons, the governor at once stops the water wheel.

Use of Twisted-Pair Service Wires

BY R. L. ELKIN

Twisted-pair conductors for the connection of telephones between pole and house is the rule in many cases, while almost invariably separate conductors are used for lighting and power service wires. Twisted-pair wires are used to some extent, and to good advantage, for connecting up small lighting and power loads in residences and cottages. In these days, when economy is being practiced in all directions, and special effort is being made to obtain business at lowest initial investment, the use of twisted-pair wires deserves attention. The Yonkers (N. Y.) Electric Light & Power Company was one of the first central station companies in this country to adopt this form of service wires, and the twisted-pair conductors have been in service now for nearly ten years with very satisfactory results.

The twisted-pair service wire has the advantage over two or three separate conductors for two and three-wire service as regards appearance, convenience and cost of installation. The additional loading due to sleet will also be less, small though it be. The wires used heretofore have been between No. 10 and No. 6, and have been twisted double or triple for two and three-wire services. The wires are usually stranded copper covered with weatherproof insulation with a triple braiding which is extra heavily waxed. Experience shows that such wires should not be externally braided, because this braiding tends to permit the collection of water, which results in the more rapid deterioration of the insulating material than occurs without.

For connecting up small cottages and similar loads where the returns that may be expected are small, it is important that the capital invested be as small as possible, since this is the deciding factor as to whether or not immediate returns on the investment will accrue. The use of twisted-pair wire, therefore, deserves careful consideration. Where such wire is applicable for telephones it would appear equally so for lighting, and that means practically in all climates except those subject to very wide temperature changes. Past experience with twisted-pair wire has shown low construction and initial cost and reasonably satisfactory life.

Data Forms for Underground Conduit and Cable Record-Pocketbook

BY R. A. PAINE, JR.

Pocket-size loose-leaf duct books have been prepared recently by the Edison Electric Illuminating Company of Brooklyn for the use of men working in the underground department, to enable them to locate any manhole or cable and indentify the latter before cutting it. Each book contains a complete record of the location of all manholes and subways (where the number of ducts is greater than two), the number and kind of ducts and the numbers of cables in each duct. Subway workmen find the books especially useful when the manholes are covered by snow. The sheets consist of 5-in. by 8-in. blueprints made from tracings which are kept in the office, where they may be kept up to date. Herewith is a reproduction of one of the sheets. North is indicated on each by an arrow, while the locations of the manholes and subway are shown on the street plan. At the lower right-hand corner is given the distance of the center of each manhole cover from the two nearest curbs. On the remaining space are developed the walls

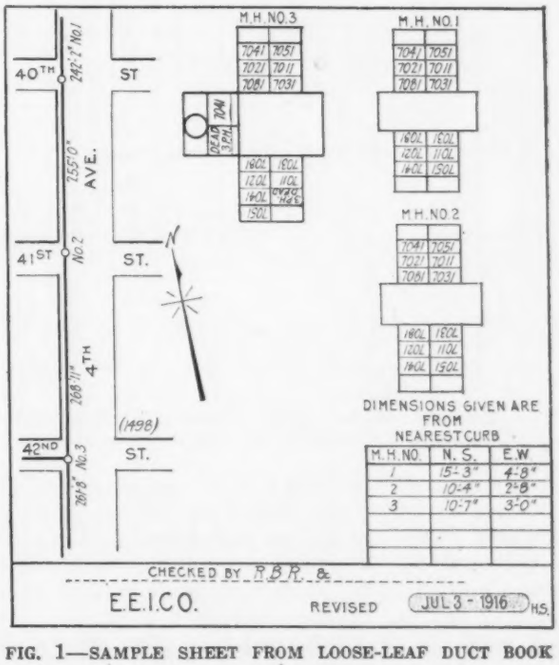


FIG. 1—SAMPLE SHEET FROM LOOSE-LEAF DUCT BOOK

of each manhole. These developments show the kind of duct (rectangles for tile and circles for fiber or iron pipe) and the number of the cable in each duct. A white space is provided in the lower right-hand corner of each sheet for the date when the record indicated was last revised.

Operating Boilers at High Rating in Rochester Plant

In steam station No. 3 of the Rochester (N. Y.) Railway & Light Company which supplements largely hydroelectric service, six 875-hp. Biglow-Hornsby water tube boilers are operated at ratings from 150 per cent to 325 per cent. The number of boilers used depends upon the water available at the hydroelectric plants and on average steady load the boilers are operated from 150 per cent to 200 per cent of rating. The load is allowed to increase however, on steady demand to 200 per cent rating and to 250 per cent of boiler rating during short peaks before cutting in additional units.

During the extreme peaks which this station carries between Dec. 1 and 20 the units have been operated from 300 to 325 per cent of rating. The boilers are equipped with nine retort Taylor stokers. The steam pressure is 215 lb. with 135 deg. Fahr. superheat. The average water evaporated per pound of coal as fired during 24 hr. is from 8 lb. to 9 lb. Under these conditions the operation of the boiler plant is said to be satisfactory, the only difficulty experienced being in connection with the maintenance of the front wall above each line of tuyere boxes. A gouging takes place in this wall which has been found due to a sort of blast action set up in the furnace.

Results When Cleaning Condenser Tubes with Sand Blast

When dirty or corrosive condensing water is used the heat transmission of condenser surfaces decreases rapidly with service, as indicated by the accompanying curve which refers to a particular installation. As shown, the hourly rate of heat transfer was decreased 440 B.t.u. per square foot per degree mean temperature difference during the first 8800-hour service or almost

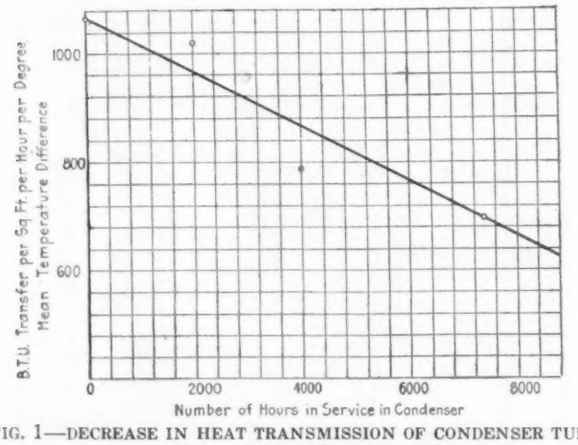


FIG. 1—DECREASE IN HEAT TRANSMISSION OF CONDENSER TUBES DUE TO LONG SERVICE WITHOUT CLEANING

41.5 per cent. To overcome this trouble several companies are scrubbing the tubes with stiff rotary brushes and water. This has sufficed where only mud and slime are encountered. By using a sand-blasting outfit like the one illustrated herewith hard scale as well as mud and slime can be removed. About 1 qt. of dry, clean, sharp sand can be discharged with the apparatus in twenty seconds so one operator can clean about 100 to 120 tubes per hour.

This method of cleaning tubes, I. E. Moultrop explained recently before the N. E. L. A., has been used by the New York Edison Company for about two years, without seriously affecting the life of the tubes due to erosion. If more sand than the amount specified is used it is probable that an appreciable amount of metal may

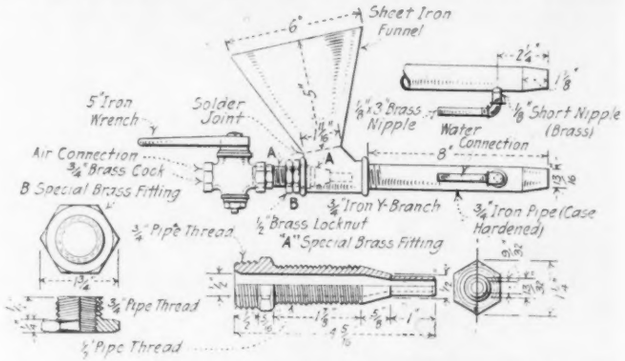


FIG. 2—SAND-BLAST OUTFIT FOR 1-IN. (OUTSIDE DIAMETER) CONDENSER TUBES

be worn off but decrease of tube life is permissible if it is attended by maximum heat transmission during the entire life of the tubes.

A Peculiar Regulator Trouble Traced to Change in Character of Load

BY GEORGE W. TEFFEAU, JR.

When a new regulator is placed in service for the first time, the connections between the primary and secondary windings should be very carefully made after an ammeter test to make sure that the minimum current is flowing in the primary coils. It is surprising how often this feature is overlooked by even the best central station electricians. Not only initial connections, but also change of load, or, rather, change of character of load, are sometimes responsible for peculiar regulator action. A case where trouble was traced to the latter condition recently came to the writer's attention.

The regulator in question was a General Electric induction regulator of air-blast type of 150-amp. rating at 2300 volts installed on an overhead three-phase distribution circuit supplying a mixed lighting and power load. The load on the circuit had increased to 165 amp. per phase, and as this was too great a load to carry on the lead cable from the station to the pole line it was decided to "cut over" part of the overhead circuit to another source of supply for relief. A branch of the circuit carrying largely a lighting load of about 80 amp. per phase was taken off and the reading of the station ammeters dropped to about 90 amp. The load left on the circuit was largely due to power service.

The flat voltage adjustment before the "cut over" was made was for 114 volts, and in order to maintain uniform voltage about two-thirds of the compensation on the contact-making voltmeter was cut in. After making the "cut over" an attempt was made to adjust the regulator for its new load condition when it was discovered that the regulator assumed a position of 3 volts boost regardless of how much compensation was used or the load on the circuit. At first it was assumed that the current transformer was open-circuited or the coil on the contact-making voltmeter was at fault, but tests showed both in perfect condition. Primary and secondary windings were also properly connected.

The current transformer was in phase *A* and the potential transformer was connected across phases *A* and *B*. After considerable experimenting it was decided that the potential and current transformers were properly connected and the thing to do was to change the contact-making voltmeter. This was done, but the regulator still refused to operate properly. As soon, however, as the branch feeder that had been cut off was reconnected the regulator went into action. As a last resort the potential transformer connection was changed so that it was across phases *A* and *C*. When this was done the branch feeder was again disconnected and the regulator operated satisfactorily.

By removing the branch feeder the power factor of the circuit was changed from 80 per cent to between 60 and 65 per cent and this was the cause of the difficulty. In so far as this regulator had operated satisfactorily for years before the change, it was not strange that the cause of the trouble was not suspected, because scores of regulators are in operation on the system and their loads have been reduced without developing this peculiar condition.

Graphical Representation of 10,000 Coal Analyses

By means of the accompanying diagram, which shows the relations existing between calorific value, volatile matter, carbon, hydrogen and oxygen content, all of these quantities can be determined if only two are known. This graphical representation is based on 10,000 coal analyses made by the United States Geological Survey and was presented in the Bureau of Mines Technical Paper No. 93 prepared by Oliver C. Ralston. It may be pointed out that different grades of coal have approximately the following limits: Anthracite, 2 to 3.5 per cent hydrogen; semi-anthracite, 3.5 to 4.5 per cent hydrogen; semi-bituminous, 89.5 to 93 per cent carbon; bituminous and sub-bituminous, 75 to 89.5 per cent carbon. In connection with these curves it may be said that the higher the percentage of oxygen in coal the higher is usually its moisture content. Ash and sulphur content do not seem to have any direct relation to the quantities plotted. This is not surprising because ash is a purely accidental constituent of coal, as most of it is from mud and sand that buried the coal in the peat-bog stage. In some cases it was noticed that many coals high in sulphur were also high in hydrogen and volatile matter, although this relation did not hold in all analyses. When the distillation of coal is carried on at atmospheric pressure or less the alteration of composition is represented by a straight line that points almost straight toward the carbon corner of the diagram. Under higher pressures, however, the line of decomposition slopes less, the higher the pressure the less the slope. Most of the coking coals exist in a part of the diagram where the resinous content is not supposedly a maximum. Those that do not occur in this field are lower in carbon, but as a rule quite high in hydrogen. Another criterion for the coking quality of coal is a high ratio of hydrogen to oxygen. When coal is oxidized by weathering its line of decomposition usually extends in the direction of the point representing CO_2.

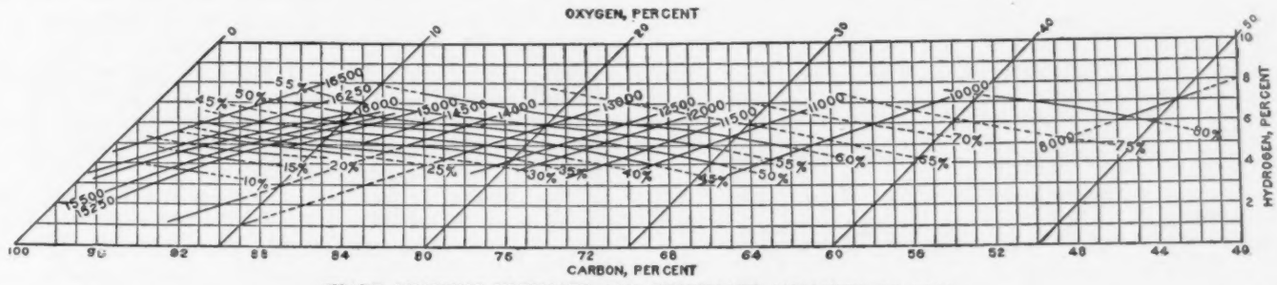
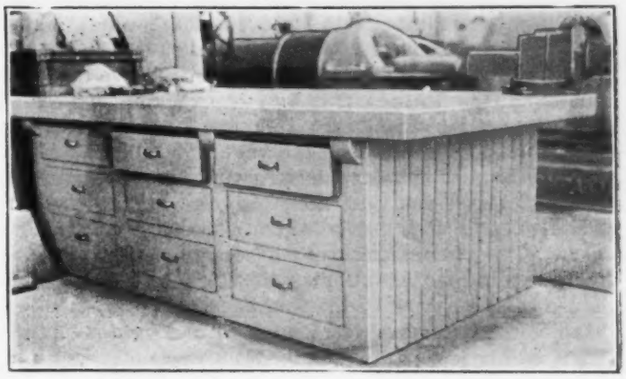


CHART SHOWING ULTIMATE AND PROXIMATE ANALYSES OF COAL

By means of this chart the calorific values of any fuels and the percentages of carbon, hydrogen, oxygen and volatile matter can be obtained if any two of the quantities are known. The figures larger than 1000 represent calorific values in B.t.u., while the middle row of figures expressed in per cent indicate the amount of volatile matter. If the volatile matter is known to be 40 per cent and the oxygen 18 per cent, for instance, then the calorific value is 13,000 B.t.u., the carbon 77 per cent and the hydrogen 5 per cent.

An $85 Work Bench Considered a Profitable Station Expenditure

In the accompanying illustration is shown a special power-house work bench which is used in the municipal light and water plant at Holland, Mich. The bench was made to order and has nine pine drawers on each side.



SPECIAL WORK BENCH USED IN MICHIGAN POWER HOUSE

Each of these measures 20.5 in. by 20.75 in. by 5 in. inside. The bench stands 34 in. above the floor, and its top, which is 3.25 in. thick, measures 54.25 in. wide by 8 ft. 2 in. long. Its top is made of 3.25-in. by 0.875-in. hard maple boards fastened together edgewise, then surfaced to a plane on top. According to R. B. Champion, manager of the plant, this solid working plane is most useful for heavy shop work, and in this way alone the bench has justified its cost of $85.

Method of Determining Condenser Leakage

Where salt water is used for condensing purposes leakage of condensers can be easily detected by testing for the presence of chlorides in the boiler feed. In one Brooklyn plant the quantity of chlorine is never allowed to exceed 200 parts in 1,000,000. The concentration is determined by taking 100 cu. cm. of the condensate to be tested, adding some methyl orange for an indicator and then gradually adding a solution containing 4.79 gr. of silver nitrate per liter until the solution turns red. The number of cubic centimeters of silver nitrate added will then be equal to the parts of chlorine present in 1,000,000 parts of water.

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

How One Central Station Inspects and Records Condition of Customers' Electric Vehicles

Customers who purchase energy for electric-vehicle charging from the lines of the Public Service Electric Company of New Jersey have monthly inspections made of their cars by the company's vehicle specialists, who tabulate the results of their inspections on data sheets, as illustrated herewith. These sheets are made out in triplicate (three different colors), one copy going to the customer, one to the car manufacturer, and the other to the Public Service files. William Miller, the electric vehicle representative of the company, points out that this system of inspections and reports eliminates customers' assertions that their vehicles are not in satisfactory condition, for a record is always on hand to show in what condition they are keeping their cars. In every such case where dissatisfaction is asserted, the cause can be traced to the customer's neglect of his car. Many of the company's customers now request inspections at frequent intervals. Mr. Miller believes that a large number of new vehicle customers have been added to the company's lines by this expression of the corporation's interest in the satisfaction of its customers.

VEHICLE INSPECTION REPORT

PUBLIC SERVICE ELECTRIC COMPANY

AUTOMOBILE DEPARTMENT

FILE NO. _____ DATE _____ 1912

OWNED BY _____ ADDRESS _____

MAKE _____ MFGS. NO. _____ MODEL _____ TYPE _____ LIC. NO. _____

BATTERY _____ NO. CELLS _____ A. H. CAP _____ MOTOR _____ SER. NO. _____

TIRES _____ SIZE F. _____ SIZE R. _____ TYPE _____

GENERAL CONDITION

BATTERY	TRAYS	JARS	TERMINALS	PLATES POS. / NEG.	SEPARATORS	SEDIMENT	
MOTOR	COMMUTATOR	BRUSHES	BAR BOSS	ALIGNMENT	PACKING	BEARINGS	
CONTROLLER	FINGERS	CONTACTS	C. O. SWITCH	LOCK	VASELINE	BEARINGS	
STEARING GEAR	TYPE	PINION	SECTOR	CON. RODS	KNUCKLES R. / L.	LUBRICATION	BEARINGS
WIRING	BELL	LAMPS	PLUG	C. O. SWITCH	TERMINALS		
COUNTER SHAFT	ADJUSTMENT	BEARINGS	PACKING	DIFFERENTIAL	SPROCKETS	UNIVERSAL	
BRAKES HUB / C SHAFT	ADJUSTMENT	PINS	TOGGLES	DRUMS	LINING	LUBRICATION	RODS
CHAINS MOORE / MULLER	ADJUSTMENT	CLEAN	OIL	SPROCKET	PINION	GEAR	WORM
WHEELS FRONT / REAR	CONDITION R. / L.	HUBS R. / L.	SPOKES R. / L.	BEARINGS R. / L.	LUBRICATION R. / L.	ADJUSTMENT R. / L.	R. / L.
SPRINGS FRONT / REAR	LINKS R. / L.	CLIPS R. / L.	HANGERS R. / L.	BOLTS R. / L.	LUBRICATION R. / L.	R. / L.	R. / L.
TIRES	CONDITION / MILES	R. FRONT	R. REAR	L. FRONT	L. REAR	REMARKS	
INSTRUMENTS	AMMETER	VOLTMETER	ODOMETER	A. H. METER	C. BREAKER	SPEEDOGRAPH	HYDROMETER

DATE PUT INTO SERVICE _____ LAST INSPECTED _____

LAST OVERHAULED _____ BATTERIES CLEANED _____ RENEWED _____

MILES TRAVELED _____

REMARKS

V.=O. K. G.=Good P.=Poor L.=Loose T.=Tight Dy.=Dry D.T.=dirty R.=Replace W.=Worn

FORM USED FOR RECORDING RESULTS OF INSPECTION OF CUSTOMERS' ELECTRIC VEHICLES

The sheets are made out in triplicate (three different colors being used). One copy goes to the customer, one to the manufacturer of the vehicle, and the third to the Public Service Company's own files.

Cincinnati Company Substitutes Comfortable Chairs and Desks for Old-time Application Counter

The most popular innovation that has lately been effected by the Union Gas & Electric Company of Cincinnati, Ohio, according to H. S. Hoover, is the substitution of salesmen's desks and comfortable customers' chairs for the old application counter and its row of clerks. It used to be the company's practice to have customers sign applications for service at this counter and to consult the credit facilities at hand to determine whether or not a guarantee deposit should be demanded from the customer.

Now the application department has been made a part of the sales department, and prospective customers desiring service are seated beside salesmen's desks which have replaced the application counter, the entire transaction being carried on between the salesman and the customer, the salesman acting as a go-between for the customer and the credit department. "No change we have made lately," says Mr. Hoover, "has met with such instant and outspoken public approval as has this one."

MINIMIZING CASH DEPOSITS

An Outline of Acceptable Customer Credit Requirements Discussed Before Ohio Electric Light Association July 20

By Thomas Kelly

Commercial Manager, Dayton (Ohio) Power & Light Company

I have often wondered whether all central stations are handling the matter of securing deposits from new customers in a way that will not antagonize these customers before they actually start to use service. Although it is fixed in my own mind that electric service is a necessity to-day, let us not conduct our business with that idea uppermost but rather with the idea of pleasing the customer at all times.

The General Code of Ohio protects electric companies in matters of credit, and provides that in the event the proposed consumer be not a freeholder who is financially responsible, or a person who is not able to give a reasonably safe guaranty in an amount sufficient to secure the payment of bills for fifty days' supply, the company can require the customer to pay a deposit equal to his average monthly bill plus 30 per cent. The company is also required to pay 6 per cent interest on such deposits after they have been in its possession six consecutive months.

Four Credit Requirements

I do not believe we would care to insist on cash deposits from all customers, in view of the 6 per cent interest requirement, therefore we should plan credit requirements that seem proper both from good business principles as well as fair treatment of our prospective customers.

Personally, I believe that if an applicant can meet any one of the following four requirements he should not be asked to make a cash deposit: First, if he has

used service for a reasonable period and paid his bills promptly; second, if he owns property in the county in which he is requesting service; third, if he has satisfactory rating; fourth, if, failing to meet the three previous requirements, the applicant for service secures the guarantee of a responsible property owner that the bills incurred will be paid.

Should the first requirement be complied with service should be furnished at once. The second requirement applies not only in cases in which the deed for the property has been turned over to the customer, but also in such instances as where he is purchasing property under contract and is making satisfactory payments. The third requirement is possibly the most difficult one to handle, and yet a good credit man can give wonderful satisfaction. A credit man who is alive to the responsibilities of his office in a company that expects his uncollectable bills to be at a minimum, and yet is anxious to earn the goodwill of its customers, should be able properly to define satisfactory credit rating. It seems a pity that we have to use the last requirement because most people are not anxious to employ this method of evading the making of a cash deposit.

IN 6025 CONTRACTS TAKEN ONLY 345 DEPOSITS ASKED

In one year a company in Ohio, using these four methods of handling its credit requirements, out of 6025 customers had to ask only 345 to make cash deposits. That is, deposits were asked of only about 6 per cent. This company's uncollectable bills which were "written off" amounted to five one-hundredths of 1 per cent of its gross earnings for that year.

The same company, to my mind, has the proper idea because it is now refunding to many customers their cash deposits with interest. This refund is made just as soon as its credit man feels that the customer is worthy of being allowed credit, and this may be after the customer has used service for a period exceeding, in most cases, eight months.

To the commercial, sales or new-business managers I would suggest "snuggling up to Mr. Credit Man." Let him appreciate your end of this great business, and if he is the proper man for the job you will find that he is not only keeping his uncollectable bills at a minimum but working so closely with the other departments of his company as to cause the least possible delay in furnishing service.

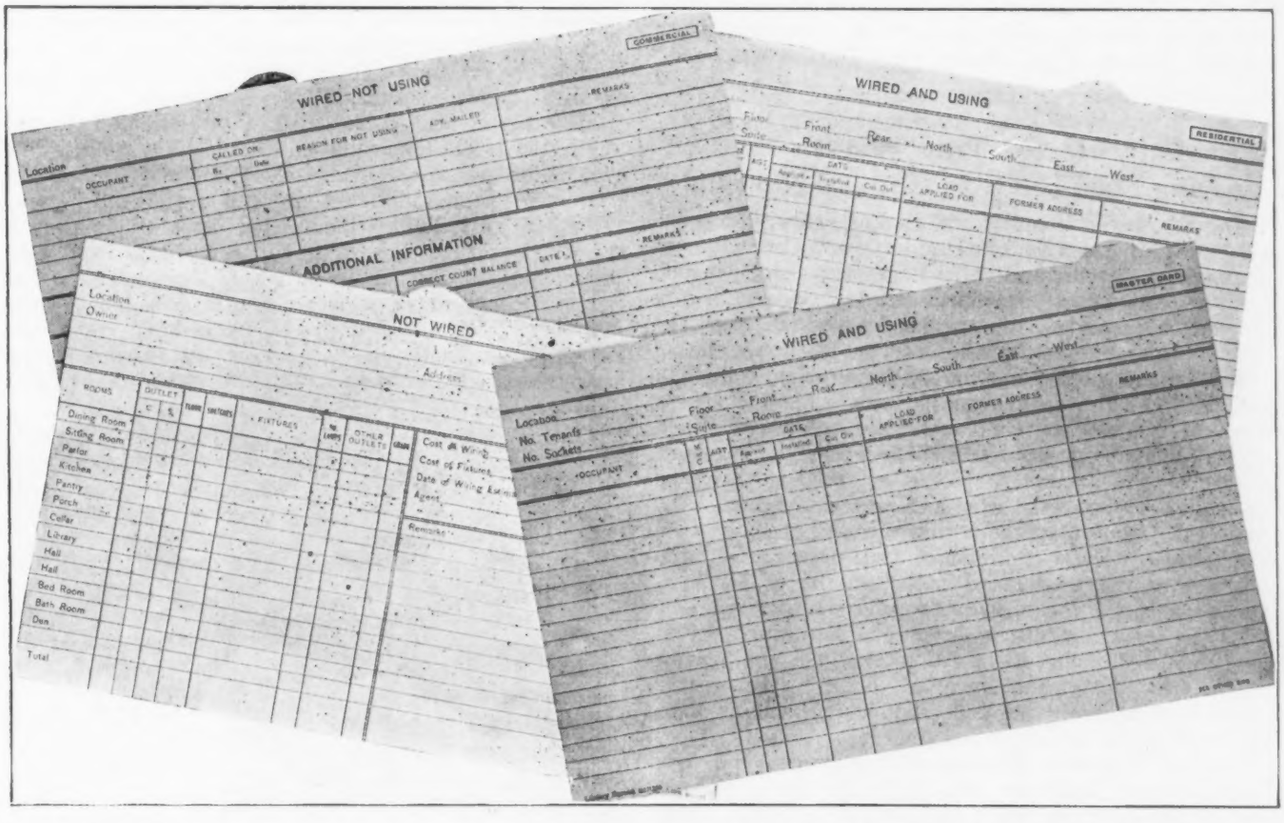
Complete Filing System for Wired House Records in Use at Hartford

The Hartford (Conn.) Electric Light Company keeps a detailed record of all wired and unwired houses, stores, factories and other buildings in its territory. Four form cards are used, 8 in. by 5 in., all printed on both sides, and filed in a cabinet according to location, *i.e.*, by districts and streets.

A cherry-tinted card is used as a master card for all buildings that have three or more apartments or other premises. On this card appears the owner's and the occupants' names, and any other information of value. For example the building might be made up of several stores, office rooms and apartments. In this case the master card would show the premises that are wired and using electricity, and those wired and not using service, besides a record of premises not wired. The side of the card containing the most up-to-date information is placed facing the front of the cabinet.

Immediately behind the master card is a buff card for each apartment or tenement that is wired, and a white card for each one that is not wired. For premises used for business purposes a salmon-colored card is used in place of a buff card. In either case one side carries data on "Wired and Using" premises, and the reverse on "Wired and Not Using," with information as to services discontinued.

From time to time lists of prospects to be followed



HOUSE-WIRING CARD RECORDS OF CUSTOMERS' PREMISES USED BY THE HARTFORD (CONN.) ELECTRIC LIGHT COMPANY

up in house-wiring campaigns are made from the white "Unwired" cards. As unwired premises are provided with electric service a buff or salmon card is substituted for the white card, which is filed with other white cards in a separate section of the cabinet.

The Sales School and the Company Employment Bureau

"Salesmanship is the human elements which enters into marketing," was the definition offered before the World's Salesmanship Congress at Detroit on July 11 by F. C. Henderschott, manager of the board of education of the New York Edison Company and executive secretary of the National Association of Corporation Schools.

"Marketing," continued Mr. Henderschott, "is as old as we have knowledge of the world, but, contrary to the generally accepted belief, salesmanship, as it is now understood, is a relatively new profession, if we may class salesmanship as a profession.

"There is a fairly general agreement that 'the elements of a sale' consist of a favorable introduction or approach, the securing of the interest of the prospective purchaser, developing this interest to the point of desire through a careful and correct presentation of the selling points of the article to be sold, and increasing this desire until favorable action results. The presentation of the selling points must not be overdone, otherwise, while one sale may be consummated, future sales are jeopardized. Satisfaction and confidence must follow the original sale. The interests of both buyer and seller must have been fairly represented in the sale or the transaction cannot be classified in the list embraced in successful salesmanship.

"The 'sales school' and the employment bureau should be closely allied. We may even go further and say that all training and the employment bureau should be closely allied. The process of training must include the employment department to insure a careful selection of the individuals who are to compose the sales department, if a highly organized and efficient force is to be developed."

Electrically-Heated Tray Wagons for Conveying Food Hot from Hospital Kitchens

The St. Marks Hospital of Salt Lake City, Utah, has a set of four dumbwaiters running from the basement to the first, second and third floors for carrying food from the kitchen to the various wards. Great difficulty was encountered in keeping the food warm from the time it left the kitchen until it arrived at the wards.

The hospital officials studied the problem carefully and finally had built seven portable wagons. These wagons accommodate twenty-six trays and are arranged with sliding doors that make them practically airtight. At the bottom of each wagon is mounted a navy-type air heater with a 10-ft. cord and plug attachment. An hour before each meal the various heaters are connected to a source of electric current so that by meal time the interiors of the wagon are heated to the proper temperature. After the wagon is loaded with its trays of food, the heater is disconnected and the whole equipment is placed on the elevator and raised to the floor to which it is consigned. Here the heater is again connected to a source of current supply and remains connected until the last tray is removed.

The new system is in continuous operation and it is found to work perfectly—the food is served to the patients quite as warm and is as palatable as when it left the kitchen range.

Wiring and Illumination

Latest Practice in the Electrical Contracting Field and in the Art of Interior and Exterior Illumination

Wiring for Electric Heating Appliances

BY TERRELL CROFT

An electric heating appliance is a device to utilize the heat produced by a current of electricity flowing in a conductor. Frequently the "resistor," which is the conductor wherein the heat is developed, is wound in a spiral or similar form so that the maximum length and resistance can be disposed in a minimum space. Among the most frequent applications of such electric heaters

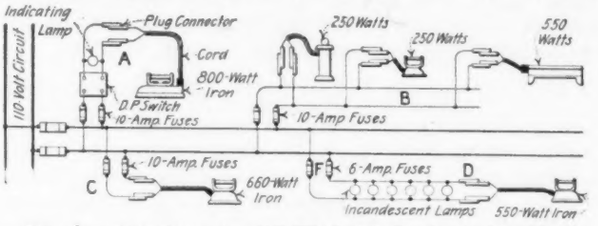


FIG. 1—CIRCUITS FOR ELECTRIC HEATING APPLIANCES

are sad irons, water heaters, room heaters, cooking devices, curling irons, and industrial heaters such as glue pots, hat irons, linotype metal pots, etc. It is obvious that by reason of its high temperature any of these devices may be a source of fire hazard, and so should be duly protected against contact with inflammable substances.

Electric heaters should not be located in dusty or linty places unless adequate precautions are taken to prevent the possibility of fire. Ordinarily, heaters in such locations should be protected in much the same way as are resistance boxes in dusty places, as outlined in *Code* rule 4*a*, paragraph 2.

Methods of wiring for electric heating devices are suggested in the diagrams of Fig. 1. Any heating device requiring power in excess of 660 watts should be protected by an individual cut-out, and should be controlled by an individual double-pole switch as shown at *A*. Devices requiring less than 660 watts each may be grouped under one set of 10-amp. fuses as shown at *B*. Or, a heating device requiring less than 660 watts may be served from an incandescent-lamp circuit as shown at *D*. In this case, however, the fuses *F* should not be of a greater capacity than 6 amp. because this

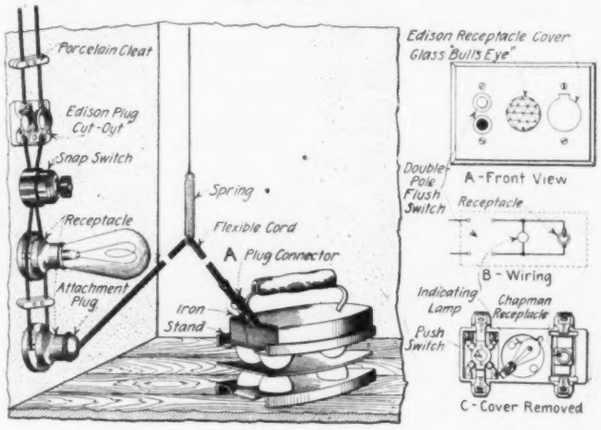


FIG. 2—PILOT-LAMP CIRCUITS FOR ELECTRIC IRONS

is the maximum-capacity fuse (*Code* rule 23*d*, paragraph 1) permissible for an ordinary incandescent-lighting circuit. In other words, if heating devices, each of which is of a capacity less than 660 watts, are on circuits from which no incandescent lamps are served, the circuits may be protected by 10-amp. fuses as shown at *C* and *B*, but if there are incandescent lamps on a circuit, the fuse capacity is limited to 6 amp. as shown at *D*.

USE OF PILOT LAMPS

Indicating or pilot lamps, though not required on heating-device circuits, are always desirable. Such a pilot lamp may be connected in multiple in a heater circuit as shown at *A* in Fig. 1, and also in Fig. 2, so that when voltage is impressed on the heater the lamp will be illuminated. A small lamp consuming only a few watts will serve. The lamp, when lighted, provides an effective visual alarm and so tends to prevent the heater switch being left closed accidentally.

Indicating switches should be used for all large heaters—that is, for heaters requiring more than 660 watts, as shown at *A*, Fig. 1, whether an indicating lamp is used or not. The switch must be in plain sight of the heater. The pilot lamp referred to above, often used in combination with the heater switch, may be considered as a supplementary indicator.

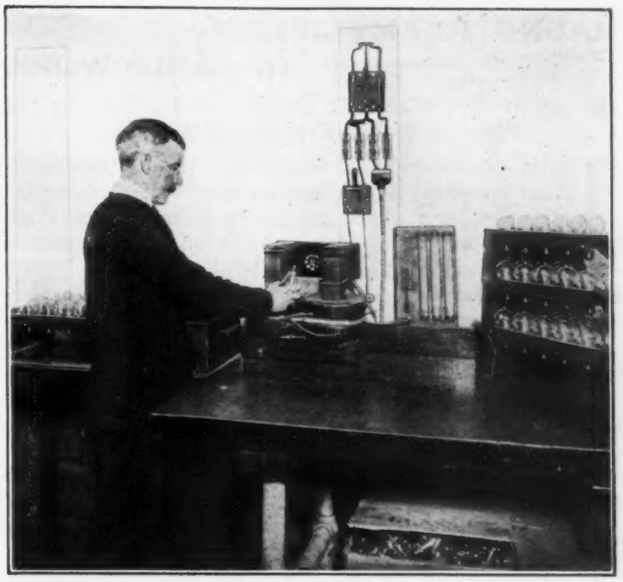
Domestic heating devices are frequently served through standard incandescent-lamp sockets. As outlined above, this practice is permissible where the load does not exceed 660 watts, but it is a much better and safer arrangement to serve the devices through special heating circuits. The switches of key sockets and the single-pole switches which are used for the control of the circuits of less than 660 watts are, in some cases, incapable of prolonged continuous service in heating-device circuits where the power load to be ruptured by the switches is relatively great.

Flood-Lighting the Statue of the "Napoleon of the Pacific" at Honolulu

During the recent celebration by the city of Honolulu, Hawaii, of the anniversary of the birth of Kamehameha the Great, the "Napoleon of the Pacific," the statue pictured herewith was illuminated by concealed flood-lighting projectors. This novel form of illumination, seen for the first time in the islands, caused much interested comment among the Hawaiian people. Through the efforts of A. P. Taylor, secretary of the Hawaii promotion committee, Mr. Forbes, superintendent of public works, and E. P. Gibson of Catton, Neill & Company, electrical dealers and agents, arrangements have since been completed for the establishment of permanent lighting of the statue. Thus illuminated, the statue of Kamehameha stands out in the night in a manner which leaves a lasting memory in the minds of those who see it. It is the purpose of various Hawaiian commercial organizations to adapt this form of illumination in a number of other ways.

ILLUMINATED STATUE AT HONOLULU

Lamp-Filament Breaker Devised by Boston Edison Company



RUPTURING LAMP FILAMENTS WITH THE AID OF A POWERFUL ELECTROMAGNET

A device for breaking the filaments of incandescent lamps which are turned in to its supply department has been constructed by the Boston Edison Company, and is in regular use in the local lamp division.

Among the thousands of incandescent lamps returned as having been burned out by lighting customers are many which, though not entirely useless, are nevertheless unfit for further service. To prevent purchasers from sorting the units and reselling those with filaments intact, a means of breaking the filaments of lamps of sizes up to 250-watt tungsten was sought. As a result, an apparatus with a laminated U-shaped core, weighing about 80 lb., was constructed. The core was wound with 55 lb. of No. 16 cotton-covered copper magnet wire, a gap being left sufficiently large to admit a large-size unit between its jaws.

The winding, in series with the resistance, is supplied from a 110-volt direct-current circuit. A powerful electromagnet is thus formed, whose field is produced by about 7600-amp. turns. A quick-acting lamp socket is arranged between the jaws of the U and is supplied, in series with a resistance, from a 220-volt alternating-current circuit. In addition to this fixed resistance another can be switched in in multiple.

As the lamps are pushed into the socket the effect is to break the filament instantly. The resistance in series with the lamp prevents short-circuiting on the 220-volt main in case of an occasional defective base.

If, as sometimes happens with very large tungstens, the filament breaks and welds near the leading-in wires, the second resistance is thrown in series with the lamp, thus allowing more current to flow and invariably breaking the filament. The direct-current field is left on continuously while operating.

With this machine filaments are broken as rapidly as the lamps are inserted in the socket and placed to one side, and the rest of the lamp is in no way injured nor is the blackening of the bulb increased.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

MAGNETIC AMPLIFIER IN RADIO WORK

Operation of a Magnetic Device for Controlling the Flow of Radio Frequency Currents

THE development of high-power radio telegraphy and telephony is proceeding in two directions. On the one hand, there are the oscillion and the Poulsen arc, and in general such radio frequency generating apparatus in which no iron is involved and for which Dr. De Forest has proposed the name "sans-ferric." Also several alternator methods are now being developed, one of the most interesting developments in this latter field being the "magnetic amplifier," described recently before the Institute of Radio Engineers by E. F. W. Alexanderson of the General Electric Company (*Proceedings* of the Institute of Radio Engineers, April, 1916). This is a device for controlling the flow of radio frequency currents and makes use of the principle of varying an inductance by changing the permeability of its iron core.

If two windings *A* and *B* are related to each other and a common magnetic structure as shown in Figs. 1

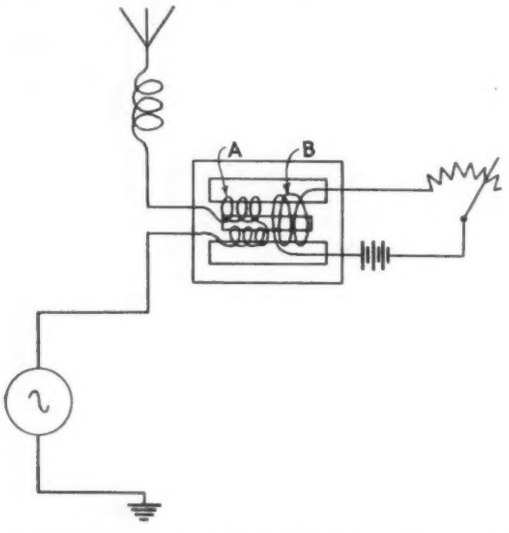


FIG. 1—COMBINATION OF ALTERNATOR AND AMPLIFIER IN SERIES

and 2, it is apparent that there is no direct transformation of energy possible from one winding to the other. Each turn in the controlling of exciting winding *B* includes both the positive and negative branches of the flux produced by the alternating-current winding, *A*, and hence there is no voltage induced in *B*. The current in either winding *A* or *B*, on the other hand, influences the permeability of the common magnetic material, and therefore changes the inductance of the other winding. If a current flows in either winding sufficient to saturate the iron, it is thereby rendered practically non-magnetic and the inductance of the other winding is reduced to the value it would have if the coil included only air. If, however, a current flows in the other winding which gives a magnetomotive force equal and opposite to the first, the iron is rendered magnetic again. Inasmuch as the two branches of winding *A* are wound relatively opposite to winding *B*, the one branch will oppose the ampere turns of winding *B* on one half cycle and the other branch during the next half cycle.

In order to have any large flux variation in winding *A*, the opposing ampere-turns must be at least equal to the ampere-turns in winding *B*. The relation of currents in these windings is substantially the same as that between the primary and secondary current in a transformer, although in this case one is an alternating and the other a direct current, or a current of a different frequency. It is thus obvious how the current flow in winding *A* can be regulated in proportion to the controlling current in winding *B*. When the magnetic amplifier is used in shunt to a high-frequency alternator, having a solid steel rotor (Fig. 2), it has the immediate object of controlling the voltage rather than the current. The aggregate of the constant-field alternator and the stationary controlling device *AB* has the effect of a machine with variable field excitation.

As indicated in Figs. 1 and 2, it is possible to connect the amplifier either in series with the alternator or in shunt to the alternator. Of these two arrangements, the shunt connection is preferable. Mr. Alexanderson's paper develops in some detail the theory of the

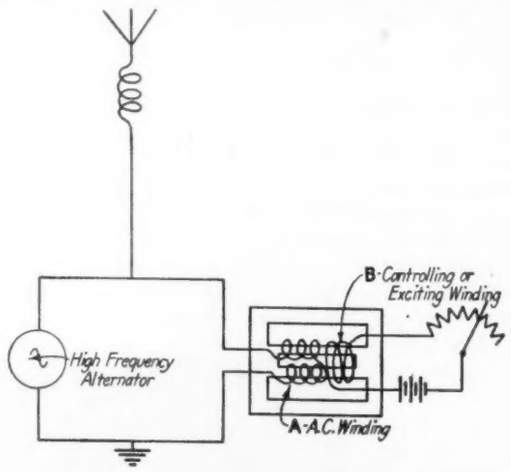


FIG. 2—AMPLIFIER IN SHUNT WITH HIGH FREQUENCY ALTERNATOR

ratio of amplification and gives characteristic curves for series and multiple connection of the two alternating-current windings.

Various arrangements of this amplifier in connection with a solid-steel rotor, radio-frequency alternator are shown, notably those in series with the alternator and those in parallel. Short-circuiting condensers are connected to each of the radio frequency coils. A shunt condenser across both coils and their short-circuiting condensers increases the sensitiveness. Another condenser inserted in series with the entire amplifier is employed to obtain linear proportionality of amplification and increased sensitiveness. The ratio of amplification is found to be proportional to the ratio of the frequency of the radio current to that of the controlling current.

The ratio of amplification for operation suitable for telephone control ranges from 100:1 to 350:1.

The control of the output of a 75-kw. alternator of radio frequency for telephonic purposes is then shown by oscillograms to be accurate, and the numerical characteristics of alternator and amplifier separately and in combination are given.

Generation, Transmission and Distribution

Electric Power Station Buildings.—JAMES N. HATCH.—An illustrated paper in which the author discusses the subject under the following headings: Preliminary studies; foundation work; smokestacks; coal-handling equipment; intake crib and tunnel; rebuilding an old station; architectural features.—*Journ. Western Society of Engrs.*, March, 1916.

Water-Power Troubles.—An article by "Rover" on "some 'hydro' troubles in Canada." He refers to the control of water wheels by oil-pressure governors. Most governors are belt driven. This is considered a weak spot, the author preferring a motor drive. Shortage of water is sometimes accompanied by sand trouble, and there are the ice troubles.—London *Elec. Review*, June 16, 1916.

Gas-Engine-Driven Electric Sets.—W. A. TOOKEY.—A paper read before the (British) Association of Supervising Electricians. It is frequently said that a gas engine should be selected to work at a load 15 per cent, more or less, lower than the maker's ratings. This presupposes that gas-engine makers have agreed upon a standard basis of rating among themselves, but, as far as the author is aware, this is not the case. Practice in this matter varies considerably. There is one important item which a maker's catalog rarely gives, and that is the diameter of the engine piston and its length of stroke; it is upon this dimension that the whole output of the engine depends and comparisons are made possible. In his practice, the author pays no regard whatever to the makers' ratings, and considers only cylinder dimensions. Knowing these, the engineer can select his own engine to suit the job, and allow such margin as he thinks is necessary. Then, knowing the speed of rotation of the engine crankshaft, and the limit of pressure behind the piston that it is advisable not to exceed, he has all the elements which enable him to exercise a wise discretion in making a selection from engines of various types and construction. The author gives a table which contains all the necessary information for such calculations, and describes how to apply this table and illustrates it by numerical examples.—London *Elec. Review*, June 16, 1916.

Installations, Systems and Appliances

Generation of Electricity on a Small Scale or Bulk Supply.—H. S. ELLIS.—A long abstract of a paper presented before the British Incorporated Municipal Electrical Association, dealing with the capability of small stations to produce electrical energy cheaply as compared with the taking of a bulk supply. The view is supported that once a small station—*e.g.*, of 2000 kw.—is in operation it does not pay to take a bulk supply. In support of this contention an examination is made of costs per unit of existing stations, first cost of plant, efficiency of plant, etc., as influenced by its size. The author first discusses the working costs, and gives diagrams showing the effect of load factor and load. He then discusses coal costs, and details of steam and electric generating plant equipment. Fig. 3 shows the rapid relative decrease in steam consumption per kelvin (kilowatt-hour) of modern high-speed turbine plant from sizes of 500 kw. to 2000 kw. "It would appear from this curve that where the conditions as regards steam and vacuum are similar the larger stations have had the advantages over the smaller ones as far as the electrical generating plant is concerned, and this is undoubtedly true as regards almost every make of turbine of the impulse or reactance types or combination of these types. How long this will continue it is impossible to say, but tests on a 1000-kw. Brush-Ljungström tur-

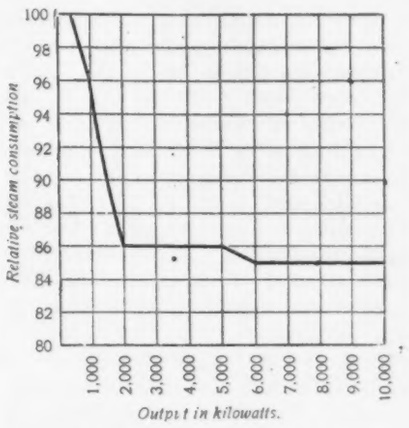


FIG. 3—DECREASE IN STEAM CONSUMPTION OF STEAM TURBINES

bine show that a machine of this type is capable of developing its full rated output with a steam consumption of only 12.75 lb. per kelvin. These results compare favorably with those obtained in connection with machines of 12,000 kw. and 15,000 kw. capacity, and certainly make one think that the big difference in efficiency which has hitherto existed between large and small units is fast disappearing. Whereas large turbines previously had the advantage over smaller ones to the extent of about 3½ lb. of steam per kilowatt-hour, they can now only claim an advantage of about 2 lb. per kilowatt-hour, or about 15 per cent." The author then takes up capital costs. Fig. 4 shows the cost per kilowatt of generating plant, and it will be observed how the steam engine holds its own against its competitor in the sizes from about 750 kw. downward. "The figures also show that there is nothing gained, as far

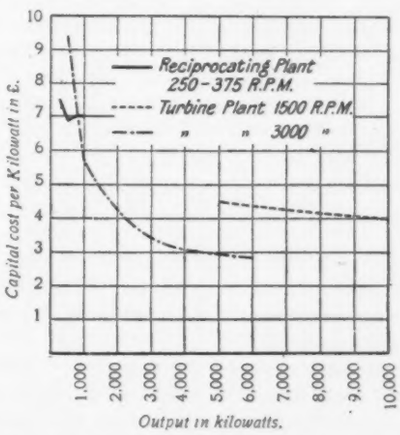


FIG. 4—COST PER KW. OF GENERATING PLANT

as the cost per kilowatt of turbine plant is concerned, by adopting the larger sizes, since owing to the reduced speed of the larger sets (1500 r.p.m. as against 3000 r.p.m.), there is quite an appreciable increase in the cost per kilowatt. Hence, in the case of South Shields it was possible to install 2000-kw. turbo sets which probably cost no more per kilowatt than the large sets installed in the generating station of the Newcastle Elec-

tric Supply Company, and without further expenditure on land, buildings, etc. It is in such cases as these that it will be extremely difficult to make out a favorable case for supply in bulk."—London *Electrician*, June 23, 1916.

Standardization of Frequencies.—An editorial note stating that there seems some fascination in the adoption by a supply authority of some frequency differing from that of other authorities, as if it were a sort of trademark showing superiority. "It is difficult to account, on any other grounds, for the fact that so many different frequencies are to be found. As an example, it may be noted that a frequency of 40 has been adopted at Perth, in western Australia, whereas the frequency in other parts of Australia appears to be 50 throughout, or at all events in most of the important cases. It would now seem as if the government of western Australia is about to adopt the frequency of 40 for general application. This has called forth a protest from the council of the Electrical Association of Australia, which has taken steps to bring to the notice of the West Australian government the disadvantage of the electrical system adopted for Perth. Not only is the frequency different, but the pressure is 250 volts, whereas voltages elsewhere are generally lower. The voltage is not nearly so important as the frequency, as it may be changed more easily, but in these days of interlinking schemes and large power networks, it seems pure folly to adopt a frequency which is different from that adopted by neighboring states. A frequency of 50 has given general satisfaction, and there seems to to be no particular point in putting forward that of 40. It is only to be regretted that the association did not take this step years ago before the plant at Perth had reached a capacity of nearly 3000 kw. A change of this kind is a serious matter when a supply has once become firmly established, but the longer the status quo continues the more difficult such a change becomes."—London *Electrician*, June 9, 1916.

Induction Regulator.—An illustrated description of a regulating device of Brown and Boveri for the rapid regulation of large induction regulators.—*Elek. Zeit.*, March 9, 1916.

Electricity Supply in Japan.—An editorial note reviewing the developments of electricity supply in Japan. Beginning in 1887 with a "home-made" seventy-five-lamp dynamo installed at Nihonbashi, in little more than a year the aggregate capacity of all the generating stations in Japan became about 500 kw. In 1907 a 15,000-kw., 55,000-volt, hydroelectric station was constructed and the power transmitted to Tokyo, 50 miles distant from the power station. At the end of 1914 another hydroelectric station was set to work. In this case the output is 14,000 kw., and the power is transmitted 140 miles at a pressure of 115,000 volts. At the end of 1914 the total capacity of the generating stations in operation in Japan amounted to 609,000 kw. There are no less than 578 generating stations owned by nearly the same number of companies. Of the latter, more than 90 per cent are joint stock companies. The most recent estimate of the available hydraulic power in Japan is 2,300,000 hp., and the utilization of this power is likely to go a long way toward promoting uniformity. From the development recorded it is evident that there should be a good market in Japan for all classes of electrical machinery and apparatus.—London *Electrician*, June 16, 1916.

Electrophysics and Magnetism

X-Rays and Crystal Structure.—W. H. BRAGG.—An account of a lecture before the British Institute of Metals on a new method of applying the properties of X-rays to the study of crystal structure. The method results in the determination of the exact relative positions of the atoms of which the crystal is composed. This new field of research depends on a principle already known. When a regular train of waves falls upon a surface separating two media, part is reflected and part goes on. If the part that goes on meets another separating surface, a second portion is reflected and some of this emerges from the second medium in the same direction as the beam reflected from the first surface. It will happen in general that the two reflected beams are out of phase and to that extent destroy one another. Whether they do or not depends upon the relation between the wave length, the angle of the inclination of the beam to the reflecting surfaces, and the distance between the surfaces. In this way are explained the colors of the soap film, of the thin layer of oil on the surface of a liquid, of the colors of steel when being tempered, and so on. If the reflecting surfaces are many in number, not two, the effect is made more intense and at the same time more precise. It occurs in the colors of potash crystals as shown by Lord Rayleigh. These crystals are formed of alternating layers, twinned across their surface of separation; and for some obscure reason the thickness of all the layers is the same though it varies from crystal to crystal.

When white light containing all wave lengths is incident upon such a crystal, at a certain angle, then only that wave length is reflected for which the proper relation between the wave length, angle and spacing holds good. If the angle is altered the wave length which is reflected is no longer the same. Hence the beautiful play of crystal colors. It is an essential cause of success that the wave length and the spacing are not very different in amount. In passing to the case of the X-rays, the author pointed out that these consist of waves which are something like 10,000 times shorter than the wave length of light. To obtain the parallel effect we must look for reflecting surfaces which are 10,000 times closer together than the twinning surfaces of the chlorate of potash crystals, and these are separated from one another by only the 0.040 in. or thereabout. These also nature has provided in the layers of atoms in the crystal. A layer of atoms acts as a reflecting surface just as a row of iron railings can act as a reflector of sound waves.—*Met. & Chem. Eng'ing*, June 15, 1916.

Absorption of Gases by Quartz Bulbs.—R. S. WILLOWS and H. TREVELYAN GEORGE.—An abstract of a (British) Physical Society paper. The experiments are a continuation of those of Willows and Hill on the absorption of gas which is brought about by electrical discharges. A new quartz bulb does not absorb air, but if fed with repeated doses of hydrogen—which are absorbed when an electrodeless discharge is passed—it then becomes very active. If discharges in hydrogen are alternated with those in air, the bulb can be made to absorb large quantities of either gas, and the activity with each gradually increases. The authors reject the theory of surface absorption and, in their own experiments at least, also Swinton's theory that the gas is shot into the walls and held there. It is supposed that chemical actions occur with air, and oxidation products are formed; these are reduced by hydrogen. The process is compared with the formation of the plates in a Plante cell; the absorption of hydrogen corresponding to the charging, and that of air to the discharging of the cell. Attempts to produce the same effects by chemical treatment are partially successful, particularly in fatiguing the bulb so that no further absorption takes place. The conditions under which the primary and secondary hydrogen spectra appear are also described.—London *Electrician*, March 24, 1916.

Readers' Views and Comments

The Engineer and Public Affairs

To the Editor of ELECTRICAL WORLD:

SIR:—I am interested in the item on page 196 entitled "Bringing Engineers into Civic Affairs." In discussing D. B. Rushmore's paper on "The A. I. E. E. and the Technical Committees" at the midwinter convention in New York, I had in part the same idea in mind.

I proposed the formation of a federal society, which may be called the American Institute of Engineers, the principal function of which would be to enable engineers in all branches of the art to act as a unit in public affairs. The principal engineering societies would become related to this institute as the states are related to our national government, *i. e.*, they would surrender to the American Institute of Engineers all functions which are not peculiar to their own branch of engineering, such as matters of public policy, professional ethics, trusteeship of funds, co-operation with the government, etc. There would also be a general standards committee, which would act as a supreme court of engineering standards in reconciling conflicting standards of the component societies. The various societies would also surrender their local sections throughout the country, and these would be superseded by local sections of the American Institute of Engineers, so that in every city of importance there would be an influential body of engineers with the backing of the great national society.

The existing technical committees of each society would be abolished and in their places a series of subsidiary societies established, which would be related to the principal societies as municipalities are related to their state. Existing societies would be invited to participate in this plan and new ones formed to cover fields which do not already have them.

The principal societies, *i. e.*, the civil, electrical, mechanical and mining engineers' societies, would take over the publication of proceedings, the collection of dues and generally assume all of the executive and routine work. Each member of a principal society would automatically become a member of the American Institute of Engineers and a member of one subsidiary society or technical section. He would receive an abstract of all papers presented to all of the societies, and those of his own subsidiary society in full. Subsidiary societies which are related by the nature of their interests to more than one principal society may become affiliated with two or more.

This general plan of uniting all the engineering societies would have advantages. A few years ago a governor of New York State refused to heed the voice of the engineers when they advised him to appoint engineers to the first public service commission of the state. Times are changing rapidly, however. Engineers have been appointed on the commissions and are receiving recognition in national affairs. Within a short time the President of the United States has asked the co-operation of the engineering societies to assist him in the selection of a Naval Advisory Board, the formation of an Engineers' Reserve Corps for the army and the compilation of a census of industrial resources. Representatives of these societies have also been invited to participate in official discussions of public policy regarding the conservation of natural resources. It would add to the engineers' prestige in these affairs if, instead of acting through four or more societies, they could exert their influence through one society, which would be known to public men and would command public respect.

W. A. DELMAR.

New York City.

Scheme for Ridding Lines of Sleet

To the Editor of ELECTRICAL WORLD:

SIR:—Every winter sleet storms paralyze telephone, telegraph and electric light service and cause thousands of dollars of damage to the line companies. This can all be avoided by a little forethought on the part of the operating companies.

Take, for example, a high-voltage transmission line 100 miles in length. This is usually a double three-wire system either on single or double towers or pole lines. These double lines are arranged in sections so that the three-wire lines can be worked either separately in case of trouble or in parallel, as operating conditions warrant. In cases of sleet open the switches at each end of this section on one of the three-wire lines and let the other line carry the load. By means of switches or wires at one end of this "dead" section short-circuit the three wires, and at the other end of the section, by means of an auto-transformer with various voltage taps, send over these "dead" circuit wires a high current at low voltage and thereby warm up the wires and melt a slot up through the ice so that it will fall to the ground and leave the wires clear of obstructions. Then switch the load to this section and proceed the same way to clear the other of ice.

Either direct or alternating current can be used if the amount of current and voltage can be controlled to suit the particular line being cleared and not overheat the wires. Transformers and high-voltage installations need not be cut out as they will not be harmed by the low voltage. This method will also locate poor joints having high resistance.

If the system only has sufficient wires for service and no "spares," it would seem advisable to interrupt service for an hour or two and clear the ice rather than to let sleet break down lines and then be out of service a week or more and a great reconstruction expense.

N. A. KEMMISH.

Spokane, Wash.

Competition of the Diesel Engine

To the Editor of ELECTRICAL WORLD:

Sir: The direct competition of Diesel engine plants with central station steam plants is a question that has engaged the attention of all interested in the generation and distribution of power. To state broadly that the extremely high fuel economy of the Diesel engine makes it a serious rival of purchased electricity is to tell only part of the story. The labor, depreciation and interest upon the capital invested must be carefully considered when the total cost of power is being estimated. These items, together with the expense of fuel and lubricating oil, will make the total cost of power compare favorably with the price of electricity as distributed by the power company.

The matter of load factor, or the proportion of the output of the apparatus to its full capacity, is a significant point in the operation of all stations. The high first cost of the Diesel engine makes the interest and amortization or depreciation correspondingly great, and these fixed amounts must be divided by the total number of useful units of work the apparatus performs, so that if the plant can operate at full load, twenty-four hours per day, this fixed charge per unit would be a minimum.

To the fixed charges must be added the cost of labor which is always an uncertainty, both as to quality and quantity, making it impossible to estimate the exact cost of this important item. In many cases the labor is practically a fixed charge and does not vary with the useful output of the apparatus. Such is the case in plants supplying electricity for light and power. The load during part of the day may be very low, but the engineer must always be kept on watch. It may be generally stated, however, that in industries where the load factor is exceedingly high and isolated from a central station, the Diesel engine finds its field and here it fits admirably.

The use of the engine by central stations will develop only as the size in which the unit is manufactured increases. At the present time about 500 hp. is the largest single unit, and this is of little interest to big power companies. As a stand-by to hydroelectric plants it presents unbounded possibilities in the larger sizes, as the engine can be started from cold in a very short time, eliminating all stand-by loss necessary in a steam station. The use of the engine by central stations as an auxiliary for load not adjacent to their lines in a community naturally tributary to the system will undoubtedly develop. Also a Diesel plant in a community where the load is not sufficient to warrant building a pole line has larger possibilities. It is probable, therefore, that the future will find central stations using the Diesel engine rather than competing with it, for it is fundamentally not economical to decentralize the production of power when the territory is served from water power plants supplemented by other types of generating apparatus.

H. L. JONES.

San Francisco, Cal.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

Howard Kinghorn of Yarmouth, Maine, has been appointed superintendent of the Yarmouth Lighting Company, succeeding Herbert H. Berry, recently resigned.

R. F. Hayward, general manager of the Western Canada Power Company, has been re-elected chairman of the Vancouver (B. C.) section of the American Institute of Electrical Engineers.

E. Burt Fenton, manager of the publicity department of W. S. Barstow & Company, Inc., has moved his headquarters from Sandusky, Ohio, to the general offices of the company at 50 Pine Street, New York City.

Frank E. Scovill has resigned as manager of the properties of the Southern Utilities Company and the Citizens' Light & Water Company of Lockhart, Tex., to move to San Antonio, Tex., where he has accepted a position of secretary and manager of the Builders' Exchange. Mr. Scovill was formerly general manager of the utility properties at Laredo, Tex.

Robley S. Stearnes, the new president of the National Electrical Contractors' Association, is the president of the Standard Electric Construction Company, Inc., of New Orleans, La., which does a large electrical construction business and also acts as local agent for some of the principal manufacturers of electrical appliances and lighting fixtures in the United States. Colonel Stearnes has been engaged in the electrical business continuously for the last twenty-six years. He built and organized a number of street railways and electric lighting plants in the South, and in addition to his business efforts, has taken an active part in the civic life of the State of Louisiana. A Virginian by birth, he secured his electrical education at Lynn, Mass., Schenectady, N. Y., and Fort Wayne, Ind. He first went to New Orleans as manager of the Southern Electric Manufacturing Company, resigning from that firm three years later to join the staff of the Fort Wayne Electric Company. He has been active in Jovian circles and besides his prominent work in local Jovian efforts, he occupied the position of thirteenth Apollo in the national order.

COL. R. S. STEARNES

W. B. Head, who has been prominent in the executive affairs of the Texas Power & Light Company of Dallas, Tex., for a number of years, has been appointed a vice-president of the company.

Robert Duerer, for many years secretary-treasurer of the Houston (Tex.) Lighting & Power Company, has gone into the insurance business at Houston, Tex., where he has offices in the Carter Building.

J. J. Cummings, vice-president of the Savannah (Ga.) Lighting Company, has been elected president of the company to succeed the late Lawrence McNeill. Mr. Cummings is one of the organizers of the company.

Walter S. Watson has resigned as sales manager of the municipal electric light department at Westfield, Mass., to accept a similar position with the United Electric Light & Water Company of South Norwalk, Conn.

M. S. Wilson, for twenty-five years head of the general testing department of the Fort Wayne Electric Works of the General Electric Company, Fort Wayne, Ind., has been appointed motor and generator inspector.

H. G. Harvey has been appointed commercial engineer with the Nassau Light & Power Company, Mineola, N. Y. For the last six years Mr. Harvey has held the position of transformer specialist in the New York district for the General Electric Company.

C. B. Woticky has been appointed electrical engineer of the Lehigh Valley Railroad and will devote particular attention to the work of standardizing the electrical equipment and method of operation in the railroad's shops and at various points along its line.

W. G. Chace, who has just been elected president of the Electrical Section of the Canadian Society of Civil Engineers, Winnipeg Branch, is a well-known consulting electrical engineer of Canada, and a member of the firm of Kerry & Chace, Limited, of Winnipeg, Man.

R. L. Daugherty, who has just been appointed professor of hydraulic engineering at Rensselaer Polytechnic Institute, has for the last six years been assistant professor of hydraulics in Sibley College, Cornell University. He succeeds at Rensselaer Prof. Lewis F. Moody who has gone into private practice. Professor Daughterty is the author of "Hydraulic Turbines," "Centrifugal Pumps" and "Hydraulics." He graduated from Leland Stamford University in 1909, and was an instructor in experimental engineering there the following year.

Claude G. Matthews, for several years superintendent of the Galveston (Tex.) Electric Company, has resigned to join the sales force of the Western Electric Company.

Frederick N. Bosson has just completed twenty-five years of service as electrical engineer for the Calumet & Hecla Mining Company and its subsidiaries. Mr. Bosson early entered the electrical field and operated the first electric street car that was run in Chicago.

B. O. Austin, who was formerly connected with the engineering department of the Westinghouse Electric & Manufacturing Company, and has very recently resigned his position with Gilbert C. White, consulting engineer, Durham, N. C., has opened an electrical, civil and hydraulic engineering office at Charlotte, N. C.

Philip E. Edelman of St. Paul, Minn., has been engaged by the Canadian government as electrical engineer to plan a system of radiocommunication to protect and secure communication in the vast Dominion parks in western Canada. A chain of wireless stations of new design will be installed to prevent forest fires and poaching, and for general park work in the Canadian Rockies, covering a territory 7000 square miles in extent. Mr. Edelman in an engineering graduate of the University of Minnesota, and has installed a number of large radio plants. He is also the author of "Experimental Wireless Stations," "Experiments," and "Inventions and Patents."

E. A. Bechstein, who was elected president of the Ohio Electric Light Association, at its convention last week, has been continuously engaged for seventeen years in the public-utility business with one organization — the Sandusky (Ohio) Gas & Electric Company. At the age of twenty-six years he entered the employ of the company in its gas department, but shortly changed to the electrical side of the business, and in less than seven years advanced to the position of manager of the company, which position he now holds. Mr. Bechstein has been one of the Ohio association's most active workers for many years.

E. A. BECHSTEIN

NEW APPARATUS AND APPLIANCES

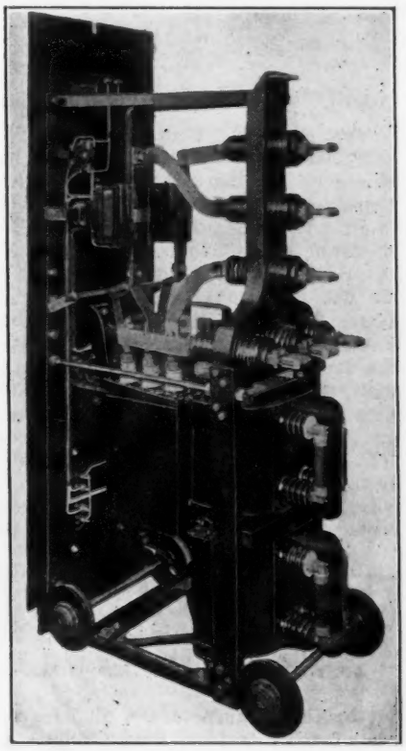
A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Safety Truck-Type Inclosed Switchboards

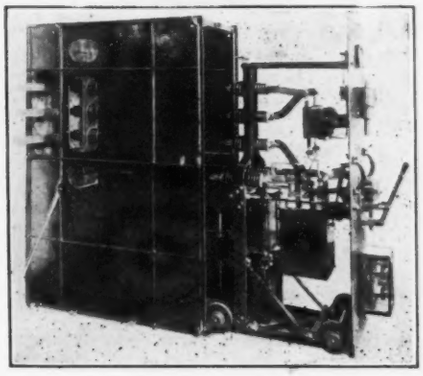
Switchboard designers are giving increasing attention to the safety of operators, particularly in industrial plants where panels are mounted in such locations that access to them can be had by employees comparatively unfamiliar with electrical devices. For use in such places the "safety-first" truck-type switchboard units here shown have been developed by the General Electric Company.

All live parts are inclosed, and danger of coming into contact with live circuits is practically eliminated. Oil switches, buses and other live parts are in compartments. This tends to reduce fire hazards and to limit disturbances to a single point. Extensions can be made readily or the units moved to other locations if desired.

Another marked advantage of this type of construction is the ease of inspection or replacement. The switchboard panel is mounted on a carriage which can be easily removed from and replaced in a stationary structure, but only when the oil switch is open. With the oil switch closed it is impossible to remove or insert the truck because of an interlock between the operating toggle of the oil switch and the stationary unit. In plants where feeders are standardized, spare panel trucks will permit systematic inspection of equipment with the least possible interruption of service.



REMOVABLE PANEL AND SWITCH ELEMENTS MOUNTED ON ROLLER TRUCK



THE SWITCH ELEMENT READY TO BE ROLLED INTO ITS ENCLOSING CABINET

The stationary member of the switchboard carries current and potential buses and disconnecting switch studs. Barriers between the current-bus studs prevent accidental contact by any one who enters the compartment. The rear ends of the current disconnecting switch studs run to buses and incoming or outgoing leads; the potential bus wires to small contact studs near the top of the compartment. The side walls have hand holes, so that the bus bars and bus wires can be continued from unit to unit. These openings when not required can be closed by removable covers. Access to the rear of a compartment can be had by means of a two-section sheet steel door.

The removable truck is mounted on wheels, and when it is withdrawn the equipment is dead and accessible from all sides. The forepart of the truck carries a sheet steel panel on which is mounted the instruments, meters, oil switches and other appliances, as shown. The current transformers are mounted on steel brackets on the back of the instrument panel. The rear of the truck carries the movable parts of the disconnecting switches, the potential transformers and small wire accessories. To center the truck and to assist in placing it in or removing it from a compartment, rails are provided for the wheels to run on.

These switchboards are regularly made in sizes for 7500 volts and 2000 amp. at 60 cycles, and 3000 amp. at 25 cycles, on the main bus. Special units can, however, be obtained for use up to 15,000 volts and 300 amp. The current capacity of the removable element is limited to 500 amp. at 2300 volts and above, and 800 amp. up to ratings of 600 volts.

Adjustable Plaster Drill

Illustrated herewith is an adjustable plaster drill which can be used to cut plaster or wood on ceilings or walls where concealed work is required and outlet boxes must be inserted flush with the surface. The manufacturer of this tool, the American Plaster Drill Company, 688 Broadway, Brooklyn, declares that this drill can cut through the thickest plaster center pieces in less time than it can be done by means of a cold chisel and hammer. Furthermore, the cup-shaped receptacle around the drill catches all shavings and plaster that are removed, so they will not litter the floor. The tool is used like an ordinary drill, being placed in the brace chuck and revolved with a slight pressure toward the material being cut.

When the drill is used where a fixture has never been installed before, a center pin is clamped in the end of the drill staff to serve as a pivot, about which the cutters can rotate. The center pin is not necessary, however, where a pipe fitting extends through the ceiling or wall, for it may be utilized as a means of centering the drill. The tool can be used over ⅜-in. and ½-in. gas pipes, since these sizes of pipe will fit inside the tubing, forming the drill staff. A thumb locknut is provided at the bottom of the plaster-catching receptacle so it may be raised or lowered, depending on the thickness of the centerpiece being cut.

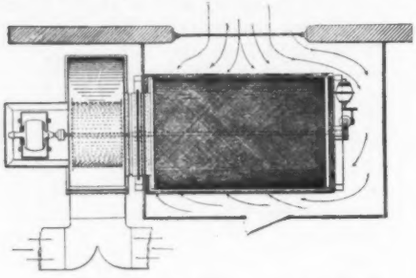
The knives on the drill may be adjusted to cut holes of any size from

PLASTER REMOVED BY THE KNIVES IS CAUGHT IN THE CUP CONTAINER

3 in. to 4 in. and are made of drop-forged tempered steel, so they can be sharpened when they wear down. In addition to the long, thin-bladed cutters, heavy cutters are provided, which have both razor and blunt edges. The blunt edge is used on plaster ceilings or walls and the razor edge on surfaces covered with wallpaper, tapestries, fine decorations or wood, and particularly on newel posts. The long knives are set so they meet resistance before the heavy ones. These knives will also cut out metal on ceilings or walls.

Rotary Air Washer

The apparatus shown herewith is a rotary air washer, made by the Wells & Newton Company, Seventeenth Street and Avenue B, New York City. It consists of a drum incased with fabric of suitable mesh which is revolved through a bath of water while air is drawn through the moistened fabric by a motor-driven exhauster. The usual speed for this air washer is 1 r.p.m., at which rate only a small amount of power is required to turn the drum. By



LAYOUT OF ROTARY AIR WASHER

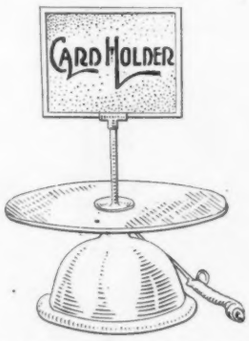
changing the speed of the washer the humidity and temperature of the air can be regulated. In a test made with one of these washers at the Union railroad station, Pittsburgh, where the local air is usually filled with soot from coal, it was found that practically all of the suspended matter was removed. The manufacturer declares that this apparatus can be furnished in any sizes and for any reasonable conditions.

Fiber Socket for Candle Fixtures

A new fiber-shell socket for candle fixtures following a popular design has just been placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn. This socket is fitted with a standard screw base and is designed for attachment to the tubing which, with the socket, is entirely covered by a glass candle. The combination is particularly intended for use with side-wall candle fixtures. A feature of the device is the amount of wiring room provided by a special forming of the contact posts. The usual form of Hubbell lugs is used, insuring that the wire will be kept in its proper place under the binding-screw heads.

Combination Showcase Lighting Fixture

The Baker-Smith Company, Rialto Building, San Francisco, Cal., has developed an ingenious combination showcase lighting fixture which not only serves for the illumination of the con-

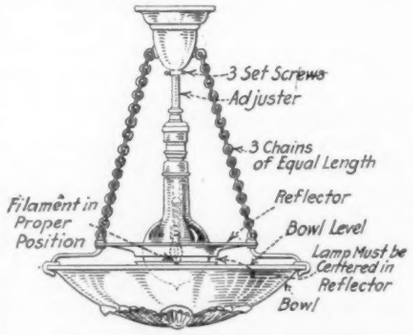


DISPLAY FIXTURE AND SHOWCASE LAMP

tents of the glass show-case on which it rests but also acts as a stand for displaying small articles and a selling placard on the top of the counter. The bowl reflector used is designed to give a proper distribution of light throughout an 8-ft. case, when a 100-watt nitrogen-filled lamp is used.

Semi-Indirect Lighting System

The Philadelphia Lighting Specialty Company, 1235 Filbert Street, Philadelphia, Pa., has brought out a semi-indirect lighting system which it terms the "Eye-Efficiency System of Illumination." The manufacturer calls particular attention to the artistic appearance of the fixture and the fact that it is easily cleaned. A feature of the



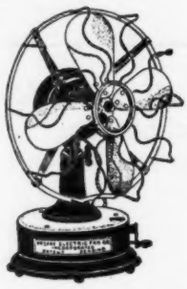
INDIRECT LIGHTING UNIT WITH MEDIAN REFLECTOR

unit is the upper reflector which is suspended by the chains at a point about midway of the lamp. After the reflector and bowl have been rigidly connected, adjustment is made by altering the position of the lamp by means of the central support for the lamp socket. Three set-screws hold the adjuster in any position desired.

The bowl can be cleaned by unhooking one of the three chains, which gives free access to the interior of the unit. These fixtures are furnished for lamp sizes of 100, 200, 300, 400 and 500 watts.

Prepayment Electric Fan

The North Texas Prepay Fan Company, 203 Sumpter Building, Dallas, Tex., is putting on the market a prepayment electric fan for use in hotel rooms and other public places. When a nickel is dropped in the slot provided,



PREPAY ELECTRIC FAN THAT OPERATES ONE HOUR FOR EACH NICKEL INSERTED IN THE SLOT

a clock element in the base of the fan is wound up for one hour, giving the user one hour's service of the fan. Several nickles can be inserted in succession for as many hours' use of the fan as are desired, and this prepaid service can then be taken either in one continuous breeze or in instalments by turning the current on and off at the socket.

Nitrogen-Filled 50-Watt Lamp

Supplementing its line of "Argolyte" gas-filled lamps which have previously been made in sizes from 1000 watts to 75 watts per lamp, the Independent Lamp & Wire Company of 1733 Broadway, New York City, has now brought out a new 50-watt nitrogen-filled unit. The new 50-watt lamp is made in the PS-20 shape and has a rated life of 800 lamp hours. It can be operated in any position but is preferably burned point downward.

Solderless Clamp Connector

Alexander B. Simpson, 152 East Fifty-third Street, New York City, has placed on the market a new solderless connector for connecting fixture wires to circuit wiring. This device, which is shown herewith, avoids all necessity for removing screws or bending the wires. To use the connector it is only necessary to thread the wire singly, one wire to both members, and to tighten the screw. The joint is then wrapped with rubber and friction tape. One such connector can be used to connect up two or three wires, of sizes from No. 14 to No. 18. When used doubly by threading two connectors on a single wire, five wires or less can be connected. These connectors, as pointed

CONNECTOR FOR ELECTRIC WIRES

out by the manufacturers, displace the use of torch, solder, flux, alcohol and scorch shields, and avoid all possibility of damage by flame or torch.

Relay Contactor Switches

The automatic-closing magnet-operated contactor illustrated herewith has been developed by the Palmer Electric & Manufacturing Company of Boston, Mass., for use under conditions where the value of the current or potential

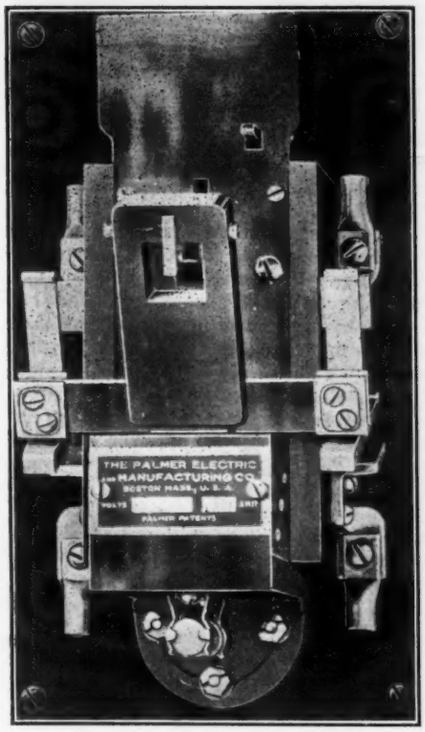


FIG. 1 — MAGNET-OPERATED CONTACTOR SWITCH

to be controlled is greater than can be handled by ordinary relays. When the relay coil *A* is energized the contactor stands open, and when this coil is de-energized its armature closes a relay circuit causing the contactor to close. The contactor described is of particular usefulness for controlling circuits of considerable current-carrying capacity from delicate contact-making devices that are slowly responsive to changes in the conditions they are in-

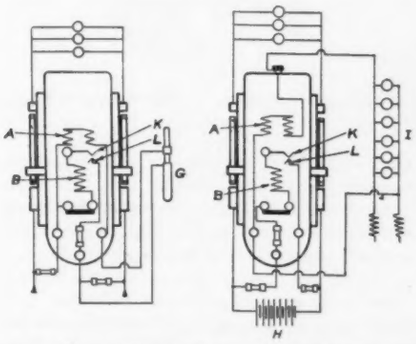


FIG. 2 — CONTACTOR CONTROLLED BY THERMOMETER. FIG. 3 — CONTACTOR ARRANGED TO THROW-OVER LAMPS ONTO DUPLICATE EMERGENCY CIRCUIT

tended to govern, for the current taken by the control coil of this contactor switch is of such small value that slowly-moving delicate contact devices will not be injured. All working parts are mounted self-contained and all wearing surfaces are of steel.

The use of one of these contactors for controlling a heating element from a mercury thermometer provided with electrical contacts is shown in Fig. 2.

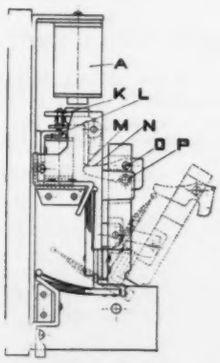


FIG. 4—MECHANISM OF CONTACTOR

At normal temperature in the circuit there diagrammed the current passes through the relay coil holding the contactor open. When the thermometer column falls, breaking the circuit, the coil is de-energized, the contactor closes and the heating unit is thrown into circuit. Upon return of normal temperature conditions the contactor is again opened. Other applications of these contactors include the operation of emergency lamps for throw-over onto duplicate circuits (see Fig. 3); the control of fire-house lamps and signals from fire-alarm circuits, the automatic charging of storage batteries with the aid of an ampere-hour meter, etc.

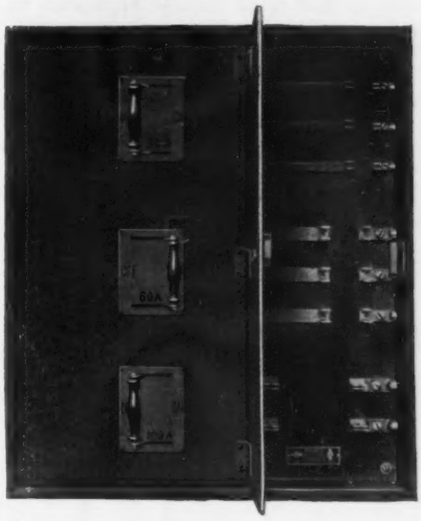
Safety Auto-Lock Switch

One of the latest developments of the H. Krantz Manufacturing Company, 160 Seventh St., Brooklyn, N. Y., is the

SAFETY SWITCH WITH PROTECTED LIVE PARTS

Safety Auto-Lock switch. Like other switches made by this company, this particular development represents a radical departure in construction from the conventional knife switch. The blades of this switch consist of laminated strips of copper attached to but insulated from a steel crossbar which is operated by an external handle through a toggle movement. The switch makes a wiping contact, has auxiliary contact points and opens the circuit with a quick, double break.

In this particular switch, however, the movable part of the switch is attached to the cover of the inclosing box in such a manner that the box cannot be opened when the switch is closed. Furthermore, live parts cannot be touched when the cover is opened, since a barrier is swung into place between the "live" terminals and the open end of the box when the cover is raised. With the cover raised the fuses are always de-energized. Holes are provided in the lugs on each side of the



SWITCHES ASSEMBLED IN CABINET

switch-handle so it may be held in the open position with a padlock. Means is also provided for locking the lid of the box closed. All parts are interchangeable and the blades can be replaced without disturbing the wiring connections.

Switches operating on a similar principle are being manufactured by the Krantz company for power distributing panels (light, power and railway service) for main switchboards, and motor starting and running switches. The switch blades for railway use are inclosed in separate compartments from the fuses, which are kept under lock and key. The switch blades and operating handle are removable on the railway switches, but they cannot be separated from the cabinet without first opening the circuit. Likewise, on replacing the blades the handle has to be in the open position.

All of the switches are equipped with laminated spring copper switch blades with auxiliary contacts and phosphor bronze outer leaves. The incoming and outgoing terminals are made of hard-drawn copper with removable striking plates. The insulation is water and acid proof. Where inclosing cabinets are used they are made of No. 12 gage steel with mitered channels.

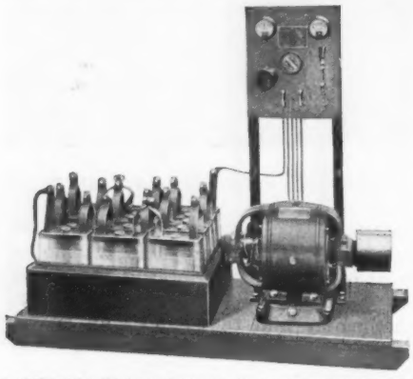
Insulating Materials

The Mogul Company, New York City, has brought out a new line of insulating materials in the form of liquids and impregnated tape or cloth, which have a variety of uses. The Mogul insulating tape, as it is called, can be furnished in

any width, while the cloth is furnished in sizes from 36 in. to 108 in. wide. Both cloth and tape can be used for electrical insulating, for water-proofing and for protection against acids and alkalis. Particular applications include winding armatures and insulating commutators, acid and alkali-proofing of storage batteries, walls, floors and ceilings; and the insulating of pipe fittings, joints and threads for the prevention of loosening and electrolysis. The insulation is said to be readily applicable to any material that is dry, such as paper, wire, wood, brick, metal, terra cotta, glass, hard rubber, porcelain fibre or stone.

Lighting Plants for Isolated Dwellings

The accompanying illustration shows the "Gralectric" lighting set which is being marketed by the Gray Motor Company of Detroit, Mich. The plant is made up as a complete unit, mounted



LIGHTING PLANT FOR ISOLATED DWELLINGS OR BUILDINGS

on skids, and is shipped to the isolated or farm customer with the batteries fully charged so that if his house has been previously wired he can have light immediately after uncrating.

These lighting plants are of the 30-volt, semi-automatic type, and provided with means for starting the engine by using the dynamo as a motor. The switchboard contains voltmeter, ammeter, automatic cut-out, rheostat, starting switch and fuses; also a name-plate on which full instructions are given for charging. The switchboard is so arranged that the manual operations have been simplified to throwing in the switch to start the engine for charging or running the generator to obtain extra capacity for operating electric iron, vacuum cleaner, etc.

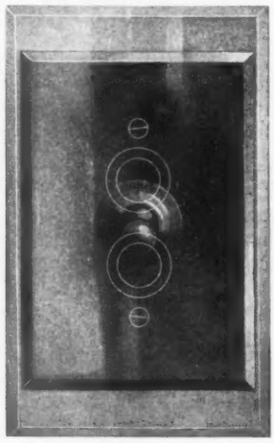
"Daylight" Lamp

A new type of nitrogen-filled blue-glass lamp that gives a white light of daylight quality is being marketed by Deuth & Co., 120 Broadway, New York City. The daylight color of the lamp is due to the special blued glass that is used, but which cuts down only 8 per cent of the light. These lamps at the present time are furnished in sizes of from 100 to 1000 watts and consume about ½-watt per cp.

The light is very soft and is said to avoid eye strain. The lamp is recommended for department stores, tailor shops and other places where it is necessary to distinguish between colors.

Toggle Wall Switch

In line with the growing demand for greater refinements in the minor details of building equipment, the Newton Manufacturing Company of Lynbrook, N. Y., has brought out its toggle switch.



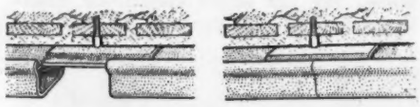
TOGGLE WALL-SWITCH PLATE COMPARED WITH STANDARD PUSH SWITCH

For the unobtrusive and attractive appearance of this switch, particular claim is made. As shown in the accompanying illustration, the plate of the Newton switch is only about two-thirds the size of the ordinary wall-switch face-plate, there are no screws in the plate, and the only protruding part is the small metal handle or lever. The plain metal plates, in oblong round or oval styles, can be had in all the regular and special finishes to conform to the surroundings of the room in which the switch is to be installed. Electrically the toggle switch complies with the most rigid requirements of American practice, the manufacturer points out. All parts subject to wear are of hardened steel and the contacts are of heavy phosphor bronze. The insulation used is durable, non-absorbent raw-hide fiber. The mechanism gives a four-way break, permitting the operation of four-way and electrolier systems without change.

Surface Wire Molding

"Wiremold" is the name of a new surface wiring material that is manufactured and marketed by the American Conduit Manufacturing Company, Pittsburgh, Pa. This material has been designed to meet the demand for a surface wiring material which would be comparatively inexpensive, of small size and easy to install, and which would require few fittings. It is neat and compact, and just large enough for easy fishing of a pair of No. 14 or No. 12 wires.

"Wiremold" is made in two wire sizes, measuring 21/32 in. wide by 15/32 in. thick over all. It is furnished complete with one coupling in 10-ft. lengths, it goes up in one piece and is designed for surface wiring exclusively. The wire is fished into the molding much



METHOD OF COUPLING MOLDING

like conduit, and no special experience is needed to install it. The base and capping is permanently assembled at the factory, since conductors cannot be laid into it, as in similar materials, but must be fished in all cases. The base is galvanized. One method of fastening "Wiremold" to the wall and of coupling lengths together is shown herewith.

The manufacturer explains that the assembling and installation of this molding on the job call for no special tools, slots, holes or screws. It is simply cut into lengths required and shoved over the coupling tongues of the fittings. Few fittings are required, and those needed are arranged wherever possible for use with standard fittings and materials. The molding is tinted with a finish which blends with the color of the average wall upon which it is used—a neutral-tone enamel.

Ornamental Diffusing Fixtures

To meet the steadily increasing demand for efficient fixtures for residence lighting, there has been developed by the Luminous Unit Company, St. Louis, Mo., a new type of "Brascolite" fixture, one of these designs being illustrated herewith.

These embody the same principle as

DIFFUSING FIXTURE WITH ORNAMENTAL BOWL

the standard types of Brascolites, namely, the combination of diffusion with reflection—diffusion from the bowl, and reflection from the flat, depolished white reflector—and are highly efficient as well as decorative. A decorated bowl and an ornamental reflector are used instead of the standard Brascolite bowl and reflector, which makes this type of fixture extremely desirable for residence use.

These Brascolites are made in two sizes: 16-in. reflectors designed for use with 100-watt or 200-watt type C lamps, and 19-in. reflectors designed for use with 200-watt or 300-watt type C lamp, and when so equipped and mounted directly on the ceiling, produce wide distribution of light.

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

RATES FOR RESIDENCE LIGHTING

Compilation of Population Served at Various Minimum Charges and Maximum Net Rates

A high minimum charge and a low net maximum rate seems to be the tendency of central stations to-day. This was brought out in a compilation made by Norton, Bird and Whitman, Chicago engineers, who are now sending to their clients a monthly rate letter.

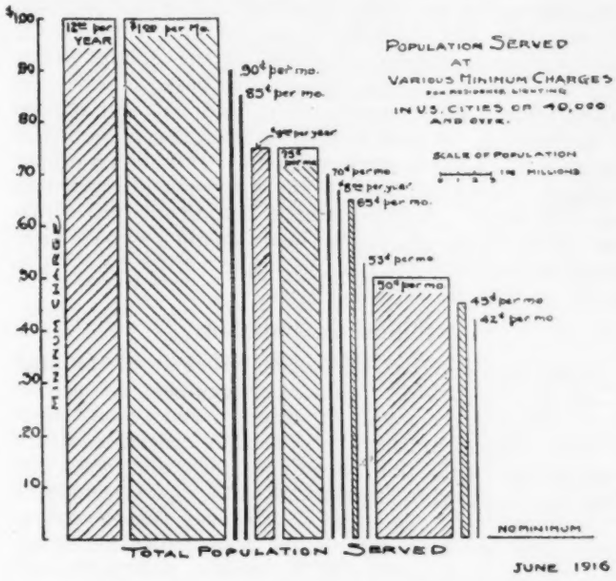

POPULATION SERVED AT VARIOUS MINIMUM CHARGES FOR RESIDENCE LIGHTING IN U.S. CITIES OF 40,000 AND OVER.
SCALE OF POPULATION IN MILLIONS
MINIMUM CHARGE
TOTAL POPULATION SERVED
NO MINIMUM
JUNE 1916

FIG. 1—POPULATION SERVED AT VARIOUS MINIMUM CHARGES

In Fig. 1 there is shown graphically the population served at various minimum charges for residence lighting for 124 cities of over 40,000 population, 1910 U. S. Census. The following figures show the number of cities and the population served at the minimum charges shown in this diagram:

Minimum Charge	No. of Cities	Population Served
$12.00 per year	9	3,125,575
$1.00 per month	44	5,558,002
90 cents per month	3	190,396
85 cents per month	2	106,954
$9.00 per year	6	1,082,579
75 cents per month	6	2,328,732
70 cents per month	1	104,402
$8.00 per year	1	88,926
65 cents per month	1	319,198
53 cents per month	1	44,604
50 cents per month	34	4,454,558
45 cents per month	1	465,766
42 cents per month	1	57,730
None	14	6,279,189
	124	24,206,611

The importance of a reasonable minimum charge, it is stated in the compilation, has been recognized by every commission that has investigated the subject, and in no case on record has a commission denied the reasonableness of such charge.

Some of the larger companies, some years ago, arbitrarily abandoned the minimum charge, but the general tendency has been to return to such a charge, as shown by the new rate filed by the Commonwealth Edison Company in Chicago, effective July 1, 1916, where in connection with the reduction of the maximum net rate from 10 cents to 9 cents, a minimum charge of 50 cents per month was re-established, with the approval of both the city of Chicago and the Illinois Public Utilities Commission.

Fig. 2 shows graphically the population served at various maximum net rates for residence lighting representing 124 cities of over 40,000 population (1910 Census).

The following figures show the number of cities and the population served at the maximum net rates shown in this diagram:

Maximum Net Rate	No. of Cities	Population Served
13.0 cents	1	79,803
12.6 cents	1	465,766
11.4 cents	1	70,063
11.0 cents	3	1,722,163
10.8 cents	4	278,627
10.5 cents	2	470,509
10.0 cents	39	7,198,417
9.5 cents	7	714,912
9.0 cents	20	3,547,500
8.6 cents	3	269,470
8.5 cents	4	1,423,380
8.1 cents	2	434,093
8.0 cents	12	4,023,127
7.6 cents	2	332,843
7.5 cents	2	103,901
7.2 cents	1	41,641
7.0 cents	14	2,036,511
6.75 cents	1	69,647
6.5 cents	1	233,650
6.0 cents	2	134,196
5.5 cents	2	556,392
	124	24,206,611

The general tendency in the reduction in maximum rates throughout the country is shown in the diagram, and yet to-day a larger population is served at a maximum rate of 10 cents than at any other rate. Most of the larger companies, however, within the last year have reduced their maximum rate below 10 cents, notably New York, Philadelphia, Chicago, Richmond and New Orleans.

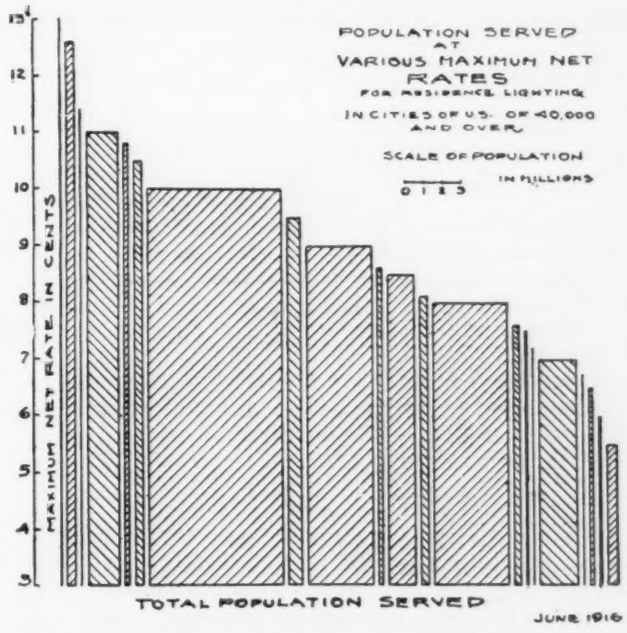
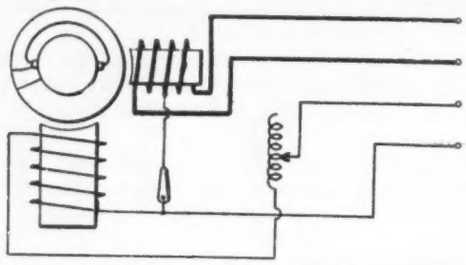

POPULATION SERVED AT VARIOUS MAXIMUM NET RATES FOR RESIDENCE LIGHTING IN CITIES OF U.S. OF 40,000 AND OVER.
SCALE OF POPULATION IN MILLIONS
MAXIMUM NET RATE IN CENTS
TOTAL POPULATION SERVED
JUNE 1916

FIG. 2—POPULATION SERVED AT VARIOUS MAXIMUM NET RATES

Variable Speed Repulsion Motor

A patent, No. 1,189,703, issued to Benjamin G. Lamme, discloses a repulsion motor which does away entirely with the necessity for resistance leads connecting the armature windings to the commutator bars. Moreover, it is claimed a speed regulation of 50 per cent can be obtained when working at 60 cycles with relatively

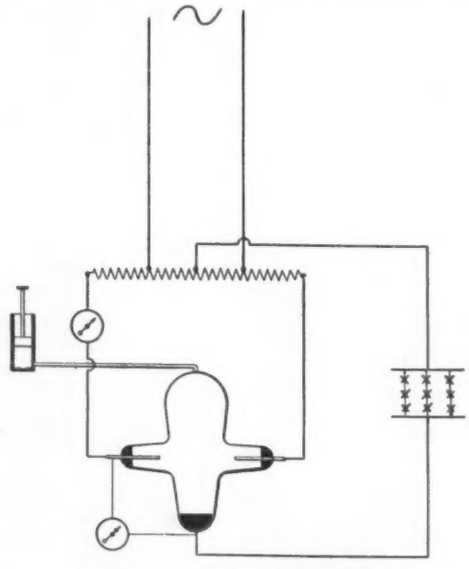


REPULSION MOTOR WITH VARIABLE SPEED

high-voltage circuits. The above result is accomplished by feeding the field or magnetizing winding with a current which is 90 deg. out of phase with the primary or energy winding. Because the frequency of the armature circuit is low under operating conditions the short-circuited current at the brushes may be held within working limits since it is dependent on the low armature current frequency. It is possible to run the above motor without transformers on a three-phase circuit by connecting the energy winding across two of the three-phase conductors and to connect the field winding between the middle point of the energy winding and the third conductor.

Regulator for Mercury Rectifiers

The specification for Patent No. 1,189,887, involving an unusual mathematical discussion of wave forms, discloses a method for regulating the efficiency of mercury vapor rectifiers. William I. Tschudy claims that not only will a pump control of the vapor pressure affect the efficiency of transformation, but that it gives an ad-



PUMP CONTROL FOR RECTIFIER

justable means for regulating the wave form of the tension and current in the electrical circuits. That the adjustment of efficiency loss can be very important is illustrated by an instance in which with a sharp peak of current the consumed power of the tube was 210 watts, while with a sine wave at the same tension it was 138 watts.

Public Service Commission News

New Hampshire Commission

In granting authority to the Derry Electric Company to issue $75,000 of preferred stock to purchase the properties of the New Hampshire Water & Electric Power Company and the Joffrey & Troy Electric Light Company, the Public Service Commission held that utility engineer's appraisal, made from an actual inventory of every discoverable item, a scale of reasonable unit prices, and in many instances the actual cost of recently constructed property, should be given weight in a sale valuation. Early losses from inefficient management, it was pointed out, are not a proper cost of developing a business.

Arizona Commission

The Tucson Gas, Electric Light & Power Company was denied permission to defer setting aside a depreciation reserve for one year, notwithstanding the fact that the company had expended a sum of money for extensions and improvements in excess of the amount necessary to be set aside as a depreciation reserve under the Corporation Commission's orders and uniform system of accounting, because it appears that the revenues of the utility as a whole were sufficient to establish a proper depreciation reserve, and to pay a reasonable return on the investment. Newly-installed equipment not releasing other equipment, it was held, should be charged to construction, but if it releases other equipment it is to be charged to depreciation reserve.

Illinois Commission

A special committee of five members from the staff of the Public Utilities Commission has been designated to standardize the forms of orders. The committee is working toward uniformity in similar orders, standard paragraphs, consistent headings, introductions, and closures, accepted abbreviations, etc. Correspondence with other State commissions discloses that comparatively little has been done in the standardization of orders, except possibly by the Wisconsin, California, and one or two other commissions.

In its preliminary report, approved by the commission, the standardization committee summarizes the necessity of standardization, as follows:

"It is the opinion of the committee that a more general study and understanding of the essential framework and the unity of a properly drafted order would be desirable; that a general conformity of similar orders written by different individuals would be conducive to effectiveness; that a standardization of definitions, summaries, closures, and sequence of thought in orders would be most desirable; that more attention given to the mechanical details of orders, such as caption, title, numbering, spacing, margins, closure, attestation, etc., would promote desirable standardization, and that some systematic method of promulgating and establishing standards, of necessity, must be devised."

Pennsylvania Commission

The Relief Electric Light, Heat & Power Company appealed to the Pennsylvania Superior Court from an order of the Public Service Commission refusing a certificate of convenience to furnish electricity in a territory served by another company, and the commission's order was affirmed. The court held that the refusal of a certificate of convenience to a corporation which had received, prior to the enactment of the public service law, a charter right and municipal franchise to furnish electricity in territory served by another company, is not an unreasonable exercise of regulatory control of public utilities, where the existing company

is furnishing satisfactory service at reasonable rates, nor does it deprive the corporation of its property without due process of law, nor impair the obligation of a contract, especially where the State retained the right to alter corporate charters.

The Consumers' Electric Company has been ordered by the commission to desist from operating or acting in any way as a public utility until after obtaining a certificate of public convenience. The commission will not allow any electric utility's claim to a legal right to operate without a certificate of public convenience, which claim has been determined adversely to it by an order of the commission, to be interposed as a defense in proceedings against it for violation of the certificate of public convenience provision of the public service law, where the order remains in full force and effect, although an appeal therefrom is pending in the courts.

An electric utility, it was stated, cannot serve the public in a borough without a certificate of public convenience from the Pennsylvania commission, either by virtue of a franchise granted by the borough prior to the enactment of the public service law, or of a resolution of the town council approved by the burgess subsequent to that date.

The Public Service Commission has dismissed the complaint brought by a resident of Garrett, Somerset County, against the Garrett Electric Light, Heat & Power Company for refusal to furnish electric service at a 6-cent rate. The commission holds that the electric company is justified in its action in refusing to furnish service at the rate noted because the consumer, in building a pole line from the borough limits to his suburban home, had a special contract and rate with the company's predecessor. The commission says that the special contract appears to have been indeterminate and, therefore, voidable; that there is no reason why the complainant should not pay the same rate (10 cents) as other residents of the borough, and that the company is not obligated in any way to purchase the pole line.

The Public Service Commission has refused the petition of the borough of Bath for the approval of contract with and certificate of convenience for the Lehigh Navigation Electric Company to furnish the borough with electricity and to erect and operate a transmission system in the borough. The request for approval was opposed by the Pennsylvania Utilities Company. The commission holds that the approvals sought are not necessary under the public service act; that the municipality must first acquire by purchase or condemnation the property and franchises of the present company furnishing electricity, and that it is not convinced that a municipal plant in Bath would best serve the public interest, and refused to approve the contract between the borough of Bath and the Lehigh Navigation Electric Company for supplying electric service within the borough.

New Jersey Commission

The Board of Public Utility Commissioners has refused the application of the Lambertville Public Service Company for permission to execute a mortgage of $850,000, with the issuance of $170,000 of bonds thereunder, on the ground that such additional capital is not warranted with the present relation between the value of the plant and the total securities of the company. In its decision the board says:

"The amount of bonds now outstanding is excessive when considered in connection with the amount of stock now outstanding. The board will give consideration to a petition for the approval of capital stock in the proper amount to pay for extensions and additions to the existing plant and system when the company is in position to show that additions to the value of at least $25,000 have been made to the plant and have been paid for from the proceeds of the capital stock. Consideration may then be given by the board to the creation of a new mortgage and the issuance of bonds thereunder."

The board has refused the petition of the New Jersey Gas & Electric Company, Dover, to consolidate with the Lambertville Public Service Company, holding that no economies in operation would be evidenced by this merger. The same interests control both properties and sought to effect a virtual consolidation for advantages in operation, submitting testimony to show that economy in operation and management by reason of greater facility in financing the properties would result from the combination.

In refusing permission, the board says:

"There does not appear to be any particular advantage to either company that would arise because of any combined supervision of these two plants, situated as they are some fifty miles apart with intervening territory that would not be considered productive of very much business. It may be true that financing of combined operations is somewhat easier than financing small companies, but in the opinion of the board this is not sufficient reason to warrant approval of the application. The operations of these companies are not cognate. One is for the production, distribution and sale of gas, and the other for the production, distribution and sale of electric energy. This fact, together with the distance between the properties, eliminates many of the opportunities for practical economy in management."

Wisconsin Commission

The policy of Wisconsin in the valuation of a dam site, flowage rights, and other property prior to the grant of a dam franchise, it was stated by the Railroad Commission upon application of the Wisconsin-Minnesota Light & Power Company to maintain a dam in the Chippewa River, directs the present value of property in connection with its use for developing water power, but denies to the owner any right to any increase in the value of the property and water power which may take place during thirty years after the issuance of the permit.

The expense incident to changing railroad rights of way from land to be flooded by a dam is a part of the cost of "flowage rights," and water power to be developed from a dam is "property."

Among the factors affecting the value of undeveloped water power are cost of development, normal flow of stream, constancy of flow, head of water obtained, degree of constancy of power, availability of market for energy produced availability of power for manufacturing purposes at the dam site, nature of manufacturing for which available either at the dam site or elsewhere, investment in subsidiary steam plant, availability of cheap coal for competitive production, and the possibility of pondage. No value will be given the dam permit in valuing undeveloped water power as a perquisite to a grant of the permit.

Consideration was given to the market value under assumed competitive conditions, as reflected by sales of other power, the cost of development, and probable earnings, without capitalizing the result of enterprise; to the probable rental value as compared to similar values of other raw and developed water powers, and to the saving in the use of water over steam. A dam site and flowage rights, it was held, should be given a value in accordance with their use to develop water power in addition to the value as land alone, in the valuation required by the Wisconsin law prior to a grant of a dam permit.

Proposed Bond Issue for Enlargement of Municipal Plant at Cleveland, Ohio.—The City Council will be asked to present to the voters at the fall election a proposition to issue $1,750,000 bonds for the extension of the municipal plant. This is to be done with the idea of furnishing power for the Cleveland Railway Company, although it is not in line with the recommendation of President J. J. Stanley of the company.

Illumination of Washington Monument in Baltimore.—The Consolidated Gas, Electric Light & Power Company of Baltimore, Md., has submitted to the local park board an offer to continue for one year, free of charge, the illumination of the Washington Monument. The company installed the equipment and furnished the current for the lighting of the big shaft free of charge during the recent Elks' convention. The illumination will continue until the park board acts on the pending proposition.

St. Louis Company Enlarges Power Plant.—Extensive construction work is under way at the Ashley Street Station of the Union Electric Light & Power Company, St. Louis, Mo., in order to bring the plant to its ultimate capacity of 100,000 kw. The great increase of the company's business has made necessary the installation of a 25,000-k.v.a. turbine and sufficient extra boilers to provide steam for the new unit. An extensive new circulating water system has been installed involving the driving of about 600 ft. of tunnel through the rock which underlies the plant. The discharge tunnel is now completed and the intake tunnel is being lined with concrete and steel. The structural steel work on the lower deck of the boiler plant has been remodeled to accommodate the ten new boiler units. Two of the old reciprocating engines were removed from the engine house to make room for the new turbine and an extension to the switchboard structure. It is expected that the new turbine unit will be ready for operation by Nov. 1.

Sauk-Suiattle Development for Nitrogen Plant.—P. H. Hebb of Tacoma has offered to sell to the city of Seattle, Wash., a power project on White River for $250,000. This is the site which Mr. Hebb has endeavored to sell the city for several years for $1,000,000. Recently the Hebb site was inspected by a special committee, which has agreed to allow the American Nitrogen Products Company to proceed with the development of the Sauk-Suiattle project. The city will step aside and allow the company to obtain the rights with the understanding that the city may utilize such power as the company may not need, and in event of the abandonment of the plans of the company to develop a nitrate plant the city will succeed to such rights as the company may possess. The committee has also completed inspection tours of other power projects in its search for a site that can be developed for a low first cost. Two offers have been made to develop plants under city plans, payment to be made in utility bonds after the plants are completed, and both of these are regarded as good offers.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Water Power of Alabama.—A rough estimate of the power that can be developed from the rivers of Alabama has been made by T. H. Friel, who places the total at 1,378,000 hp.

Bill Posters to Work Out Effective Electrical Week Poster Board.—The Poster Advertising Association at its recent Atlantic City convention passed a strong resolution indorsing "America's Electrical Week" and the progressive advertising program of The Society for Electrical Development. The retiring president named a committee to work out an effective poster board for distribution for the fall campaign's outdoor advertising.

Storage Battery Separators.—An improvement in wooden battery separators is suggested by James M. Skinner in patent No. 1,190,025, which overcomes the usual defects whereby the denser layers of the wood employed have heretofore practically determined the electrical resistance of the separator plates. The improvement consists in arranging the natural laminations in planes substantially at right angles to the plane of the battery separator. It is suggested that the battery separators be made from quarter sawn lumber.

Property Owners May Wire Own Houses.—The new electric-wiring ordinance of Tacoma, Wash., has been referred back to the Council committee with changes made that were asked for by the committee. Among the important changes is one that permits property owners to do wiring in their own houses if they are capable of doing the work, and the fee for inspecting circuits was eliminated. License fees for contractors were increased from $25 to $50, and the bond was reduced from $1,000 to $500. A change was made allowing a licensed journeyman electrician to have a helper without a license.

California Electrical Light Companies Give Fund to College for Tests.—Five of the big California electrical companies have contributed to a fund totaling $1,500 to enable Leland Stanford University to carry on some tests of insulators which undoubtedly will be of great value, both from a scientific standpoint and from that of the companies in their business. The university is in a position to conduct such experiments successfully because of its high-tension laboratory. The companies which have joined in raising this fund are the San Joaquin Light & Power Corporation, Pacific Light & Power Corporation, Southern California Edison Company, Sierra & San Francisco Power Company and Pacific Gas & Electric Company.

Southern Company Increases Voltage to Large Customers.—The Columbia (S. C.) Railway, Gas & Electric Company is changing the voltage of its power lines supplying large customers, such as mills, etc., from 3200 volts to 13,000 volts.

Cable Not in Use Damaged by Rats.—The cable recently installed in ducts laid in the walls of one of the new rapid transit subways in New York City was badly eaten by rats. The cable in question was tested at the factory and again after installation, proving to be satisfactory both times. There was then a delay of several weeks before the time came to put it into operation. Just before putting it into service a final test was made and the cable broke down. The fault was located in the ducts between manholes and when drawn out the length clearly showed how it had been damaged. The teeth of the rats had gone not only through the lead sheath but through the rubber insulation as well and the bare copper of one of the wires could be seen. The only reason that can be advanced for the rodents eating into the lead sheath is that they thought it was a water pipe and were thirsty. While similar cases have been known of rats eating into lead-covered cables those reported have been alternating current cables and in service at the time when they were damaged. The explanation in these cases has been that the rat heard a slight hum from the alternating current and thought it was water flowing in the pipe.

Court Holds Franchise Perpetual.—In refusing to accept the motion of the city of Omaha, Neb., for the dismissal of the case in which it and the Omaha Electric Light & Power Company are contending, Federal Judge J. W. Woodrough indicated that his final decision would be adverse to the city, basing his refusal on the ground that the United States Supreme Court had already decided the issues and that he would find accordingly. The Old Colony Trust Company case, which went to the Supreme Court in 1911, was an action instituted by the bondholders of the lighting company to prohibit the city from disconnecting the power wires of the company. The city contended that the franchise gave the company the right to sell energy for lighting purposes only, while the company claimed that it included the right to sell the energy for lighting and heating purposes. The finding of the Supreme Court was adverse to the city, holding that the company had a perpetual right to sell electric energy, and Judge Woodrough takes the position that this judgment includes the power and heat uses of the current. Inasmuch as the Circuit Court of Appeals has already interpreted the Old Colony decision as including the heat and power uses, the only possibility for a final victory for the city lies in the Supreme Court, which might modify its findings to a perpetual franchise for lighting without including the power use. The city will continue the suit now before Judge Woodrough by bringing forward more evidence and appealing it.

N. E. L. A. Extends Thanks to Technical Press.—At the thirty-ninth convention of the N. E. I. A. held in Chicago, Ill., during the week of May 22, the following resolution was unanimously adopted by the convention:

"Whereas, the technical press has done much to promote the notable success of this convention and has done throughout the year excellent work regarding the work of the association and promoting the welfare of the central station industry, it is hereby

"Resolved, That the thanks of this association be extended to said press for its co-operation, accompanied by a warm congratulation on the admirable series of special numbers issued signalizing this meeting."

Kansas City to Sell All Lamps to 100 Watts at 19 Cents.—The light department of Kansas City, Kan., is planning to offer to customers all lamps up to and including 100 watts at the level price of the 25-watt lamps. Formerly all lamps were sold at cost, but now all will be sold at 19 cents, if the commissioners approve the plan. "While we don't want to overlight the patron," said L. H. Chapman, commissioner of water and light, "we want to make sure that he is not underlighted because of the higher cost of the larger lamps. The chief consideration is that everybody should have enough light and that the city form the habit of using plenty of light. The small amount lost on the lamps sold below cost, it is figured, will be made up within a year after their installation on additional energy used.

Electricity Reduces Copper Production Cost by 1 Cent per Pound.—The Anaconda copper mine, which to-day is producing the red metal at the rate of 330,000,000 lb. annually, will by the end of 1916 be using electrical energy at the rate of 700,000,000 kw.-hr. annually, or at the rate of about 2 kw.-hr. per pound of copper produced. Applied to all the power needed for mining reduction and transportation operations, electrification has meant a saving to the Anaconda of from $3,500,000 to $4,000,000 annually, as against what could be done with steam power under present conditions and at the present rate of operation, and much more as against what was done with the isolated steam plants in use before electricity was substituted. Applied to the present rate of production, this means a saving of somewhat more than 1 cent per pound.

Congressional Committee to Investigate the Subject of Government Control.—The resolution of Senator Newlands of Nevada, authorizing the appointment of a joint sub-committee of five senators and five representatives from the Senate committee on Interstate Commerce and the House committee on Interstate and Foreign Commerce passed the House last week. The committee would investigate the subject of government control and regulation of transportation, interstate and foreign, the advisability of government ownership of express, telegraph, telephone, etc., the efficiency with which existing systems protect the rights of shippers, control of the incorporation of carriers and proposed changes in the personnel of the Interstate Commerce Commission and the acts to regulate commerce. The various departments, bureaus and commissions of the government would be required to furnish such information as the commission may require. The committee would be required to report to Congress before Jan. 8, 1917.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Southwestern Electrical & Gas Association.—The thirteenth annual convention of the Southwestern Electrical & Gas Association will be held on April 26, 27 and 28, next, the place of holding to be announced later.

Dallas Electric Club.—Dean Harry T. Moore, spoke briefly on "Personal Service" at the July 14 luncheon meeting of the Dallas (Tex.) Electric Club and Jovian League.

Manufacturers Council.—The Electrical Manufacturers Council, composed of a delegation of four members each from the Electrical Manufacturers Club, The Electric Power Club and the Associated Manufacturers of Electrical Supplies, held a meeting on July 17 in New York. Many matters of importance to the associations represented, and the industry at large, were considered. The council met again on July 26 in New York.

Texas Electrical Contractors. — Eugene Ashe has been elected secretary of the Texas Electrical Contractors' Association to succeed Charles W. Graham, resigned. Mr. Ashe has had long experience in the contracting game and is fully qualified to fulfill the duties of the position which he now holds.

Associated Manufacturers of Electrical Supplies.—The board of governors of the Associated Manufacturers of Electrical Supplies held a meeting on July 12 at the Hotel Nassau, Long Beach, Long Island. There was a full attendance and many matters of importance were discussed. This will be the last meeting of the summer, and another will not occur until the latter part of September, the time and place for which has not as yet been decided upon.

The interior conduit section held a meeting on July 18 at the Hotel McAlpin, New York. Practically all members of the section were present. D. H. Murphy, president of the American Conduit Manufacturing Company, Pittsburgh, Pa., was elected chairman of the section, Oscar Hoppe, of the American Circular Loom Company, New York, was elected secretary, and Russell Dart, of the Alphaduct Company, Jersey City, was elected treasurer. A number of sub-committees were appointed and many activities planned for the coming year.

Electrical Men Attend Rotary Convention.—The holding of the convention of the International Association of Rotary Clubs in Cincinnati, July 16-20, brought five thousand persons to the city, including several score connected with the electrical industry. Local representatives of the various branches of the trade included W. W. Freeman of the Union Gas & Electric Company, in the light and power section; F. D. Van Winkle of the De Vere Electric Company, in the section of electrical supplies and construction, and C. D. Corbus, in the section of lighting fixtures. Each trade section held a separate meeting on Tuesday afternoon, following a luncheon at which separate tables were provided for the various trades in the hotels and restaurants of the city. W. R. Power of Huntington, W. Va., was chairman of the light and power section; L. E. Reid, St. Joseph, Mo., of the electrical supply section, and Frank Brezeczkowski, Chicago, of the fixture section.

Electric Club-Jovian League Picnic.—It has been decided that the fifth annual picnic of the Electric Club-Jovian League of Chicago will be held at Ravinia Park, Chicago, on Aug. 10. W. R. Pinckard of the Westinghouse Electric & Manufacturing Company, is general chairman of the picnic committee. Other sub-committee chairmen are: Grounds and transportation, H. A. Mott; music, A. R. Bone; co-operation, Perry Boole; games, Guy W. Lunn; prizes, J. D. A. Cross; decorations, W. R. Bonham; automobiles, J. N. Pierce; publicity, F. H. Bernhard; dancing, A. B. Hatch; reception, Victor Tousley; refreshments, R. I. Phillips; police, J. B. Griffith; program, Fred M. Rosseland; tickets, H. G. Hafner; finance, Stephen Gardner, and photography, T. B. Lambert.

Company Section Receives Silver Trophies.—Samuel Insull has presented five sterling silver trophy cups to the Commonwealth Edison Company section of the National Electric Light Association to be awarded each year to winners of the various athletic contests. The bowling, baseball and rifle clubs will each be recipients of one of the trophies each year, and the individual winners of the tennis tournament and golf tournament will be presented with one of them. Any team or person winning a cup three times in succession will become the permanent holder. The names of the winners of these trophy cups will be inscribed on the cups each year and the photographs of the winning teams and individuals will be placed in the company "hall of fame" as a permanent record.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

KENNEY PATENT UPHELD IN DISTRICT COURT

Vacuum Cleaner Company Wins Suit Against Innovation Electric Company on Basic Vacuum Cleaner Patent

Declaring that the Innovation Electric Company, Inc., manufacturers of the "Magic" and "Liberty" vacuum cleaners, infringed the fourth claim of patent No. 847,947 for a vacuum cleaner, Judge Mayer in the District Court of the United States of the Second District of New York recently issued a permanent injunction enjoining the company from making or selling vacuum cleaners. An appeal has been taken, pending which the injunction is temporarily suspended.

This patent, known as the Kenney patent, was granted to David T. Kenney, on March 19, 1907, and was subsequently acquired by the Vacuum Cleaner Company, the present owners. The case is regarded as a test case, and in view of the extensive growth of the vacuum cleaner business naturally is of considerable importance.

This patent is the basic vacuum cleaner patent, it was held by Judge Mayer in a previous suit by the owners of the patent against the American Rotary Valve Company. At this time the court said, "There is no doubt that Kenney, the patentee, was the founder of the present vacuum cleaner commercial art and that, prior to his time, efforts in the same direction resulted either in indifferent success or in absolute failure, although as far back as 1869 inventors had turned their attention to the subject matter here concerned."

In the suit against the Innovation company the court pointed out that the "fundamentally important proposition which Kenney taught the art and practically exemplified was the vacuum idea as contrasted with the air-current theory. He may not have known the ramifications of the scientific side, but what he did know was that if certain instrumentalities are employed in a certain way the dirt will be sucked up from beneath the surface that is to be cleaned."

The fourth claim which the defendant infringed was for: "A cleaner comprising a suction chamber provided with a narrow inlet slot, the slot being bounded and defined by lips which lie in the contact surface of the cleaner, with the outward mouth of the slot lying in the plane of this contact surface substantially as described."

In disposing of the suit Judge Mayer said: "In effect, the position of the defendant is that the patent is limited to a high vacuum system; that the cleaning tool must have a large suction chamber provided with an exceedingly narrow slot, the edges of which have protruding lips. Thus construed, the argument is that defendant does not infringe because its devices are provided with vacuum producers utilized in connection with a cleaning tool which has a wide open mouth with no suction chamber and no protruding lips. The argument on broader grounds rests upon the proposition that defendant's devices operate upon the air-current principle so that the dirt is removed solely by the suction of air currents which in passing by the dirt lift it and carry it away, as distinguished from the vacuum principle of the patent in suit which, as the expert Reeve puts it, acts on a sort of tornado principle, whereby the dirt is violently disturbed and sucked so as ultimately to reach the depositary receptacle.

"Without further discussion I am fully satisfied that Claim 4 is valid and, notwithstanding that defendant's machines have a wider slot or mouth than Kenney's preferred form, and a lower vacuum, it seems to me that they infringe Claim 4."

AMERICAN ELECTRICAL DEVICE MANUFACTURERS HIT

Recent Orders Prohibit Imports of Vacuum Cleaners and Electric Cooking Devices Into Great Britain

Recent orders by the British Government prohibit imports of ranges, stoves and vacuum cleaners. The latter may be imported under a license given by the Board of Trade. However, licenses will not, in general, be granted, according to an official announcement, except where it can be shown that the goods were either en route for Great Britain or actually paid for at the date of the proclamation, June 27.

Should the British Government become severe in carrying out these orders it is generally felt in Great Britain that all electric cooking utensils will come under the head of ranges and stoves. In such a case American manufacturers of vacuum cleaners and of electric cooking devices will be especially hard hit.

It is a well known fact that in both of these lines American-made products dominate the British market. It is believed, however, that there are certain loopholes, the exercise of which will be permitted by the government, upon presentation to the government of the facts. These orders are part of the British program to increase the ocean freight space for government importations.

UTILITIES ONLY CAN AFFORD TO PUSH RANGES

Larger Lists and Larger Discounts May Be Necessary to Promote Trade with the Jobbers, Dealers and Contractors

With the inauguration in October of the new list prices and discounts on all electric heating devices will come the first real test of the efficiency of these prices to meet the conditions in the jobbing and retail trade field. There seems to be little doubt but that the prices on the small heating devices allow the distributor a fair profit. On the electric range, however, murmurings, which it is expected will become much louder, have been heard that there is not a sufficient margin of profit for the distributor.

It is not difficult to understand why range discounts are not as large as those of other heating devices. There has been an almost incessant demand from certain quarters for less expensive ranges, and the manufacturers by lowering the discount can lower the list price. The jobber, dealer, contractor, central station, etc., of course, stand the difference, and unless altered the situation will be about as follows when the new prices of ranges go into effect: An $80 range may be purchased from the manufacturer under the most favorable conditions by the jobber for $45.25; by the central station for $47.75; by the dealers and contractors and other stores for $55.86. Under these conditions the gross profit to the jobber will be $34.75; to the central station, $32.25; to the dealer, contractor, etc., $24.14.

As was shown in the Electrical World of July 15, this profit is not sufficient to tempt the jobber except when selling at retail. in which market his sales of ranges are often negligible. For the central station and the contractor the profit on the sale is increased by other profits, the former from energy consumption and the latter from wiring charges on the installation.

Taken, however, as a purely merchandising problem it is doubtful if the sale of electric ranges will be greatly pushed by any but central stations. Educating the public, adver-

tising, soliciting, demonstrating, looking after the range once installed, cartage, freight (which may be allowed in certain instances, but as a rule is not), reserves for dissatisfied customers, all in addition to the regular charge of rent, light, heat, salaries, etc., make the selling of an electric range very costly to all distributors except the lighting company.

During the period of introduction it is not natural to suppose that the central stations, in view of the load possibilities, will consider the merchandising profit too seriously. The tendency, therefore, will be to make the price as low as possible. After the period of introduction is over and the distributors begin to look on the electric range as a merchandising proposition it may be too late to increase the price of the range to a point where a larger profit is assured.

TRADE ACCEPTANCES

Three-Fold Advantages—Legal Evidence of Debt, Better Discount Terms, Firmer Credit

Trade acceptances, which are commonly used in England, France and Germany, are little understood in the United States. In fact, until the establishment of the Federal Reserve Banking System trade acceptances had little commercial value here. The Federal banks are now urging greater use of acceptances and as business becomes more acquainted with their value they undoubtedly will be much more freely used by both electrical jobbers and manufacturers.

The trade acceptance is a negotiable instrument which offers prima facie evidence of a transaction, whereas the open account is merely a memorandum which may be repudiated by the buyer.

To the jobber and manufacturer it has three advantages: (1) it gives legal evidence of the correctness of a bill and the date on which it is to be paid; (2) it is discountable at more favorable terms, and (3) jobber can obtain a larger and cheaper credit and thus require smaller capital to carry on his business.

The banker considers it superior to a promissory note, which gives no record as to the purpose of the loan, whereas the trade acceptance defines the obligation, is self-liquidating and likely to be paid at maturity. It has been used almost exclusively in Europe for many years and has proven most satisfactory.

To the retailer, also, it offers the advantage of better service from the jobber without increase in cost. If bills are not paid promptly the jobber is compelled to minimize his selling service. It will also prevent overstocking and lead to more careful and thorough collections.

CREDIT SITUATION GOOD

Tendency to Overstock Kept Down and Only the Minimum Risk Taken

Ever since last fall the condition of credits in the electrical industry has been good. During the latter part of 1914 and the first half of 1915 business was poor and credits were very much depressed. About the middle of 1915 matters took a turn, business grew better, money became more plentiful and easier, and construction began to increase rapidly.

Since that time a stupendous volume of business has been done, wages have increased and prosperity has generally settled in this country. Confidence, therefore, in conditions, which for the present at least seem extremely bright, more liquid assets resulting from a large volume of business and a more judicious credit management on the part of sellers have combined to bring about the present good credit condition.

More so probably than ever before has this sellers' market been a difficult problem from the credit standpoint. Supply dealers, contractors and jobbers have had a tendency to overstock. It was quite natural under the prevailing conditions and therefore was hard to cope with. Supreme confidence in the continuance of good business and greatly delayed deliveries have been the direct causes of overstocking. Under ordinary conditions it would not be difficult to keep down overstocking by promising to keep the customer up to a certain stock continually. Deliveries, however, have been so delayed that such promises could not be honestly given. It has been very hard, therefore, for the credit men to convince the distributors of electrical goods of the error in overstocking.

For the most part, though, it is understood, collections have been fair to good and credits have been kept down to the minimum risk. There is evidence of less indulgence on the part of credit managers than formerly.

RECORD ELECTRICAL EXPORTS

May Figures Total Up to Approximately $3,500,000, or $500,000 More than Previous High Mark

Larger than the previous high mark by half a million dollars, or 16 per cent, the electrical exports during the month of May amounted to $3,437,609. The last record month was February, when the exports amounted to $2,942,611.

With the exception of insulated wire and cable and interior wiring supplies the May, 1916, exports were larger than those during the preceding May in every item. There was a decrease, however, of $10,000 in insulated wire and cable and of almost $100,000 in interior wiring supplies, etc., including fixtures.

The most marked increases in comparison with May, 1915, were in the following items: Metal filament lamps, $100,000; motors, $220,000; telephones, $300,000; transformers, $150,000, and miscellaneous equipment, $800,000.

In individual articles May was the record month of 1916 in the exports of tungsten lamps, $140,649; meters, $79,641; telephones, $358,675; transformers, $173,988, and miscellaneous equipment, $1.572.175.

During the first five months of 1916 there was exported $14,214,086 worth of electrical goods, as compared with $8,977,060 for the first five months of 1915. At this rate 1916 exports will total very close to $34,000,000.

Exports for the eleven months ended May 31, 1916, were $27,103,876, the largest eleven months total of American electrical exports on record. For the eleven months ended May 31, 1915, the electrical exports were $17,724,676 and the year previous $23,610,407.

It should be kept in mind that these figures are for values only and not for volume of merchandise. It is hardly fair to make comparisons with previous years on the basis of value, because of the inflation of the present prices. Were it possible to compare the exports on a volume of goods basis, instead of registering records, it is more than likely that the totals would be but little greater than during the preceding lean year when the volume of electrical export business was very small.

The segregated figures as compiled by the Bureau of Foreign and Domestic Commerce follow:

EXPORTS OF DOMESTIC MERCHANDISE, BY ARTICLES AND PRINCIPAL COUNTRIES

	May		Eleven Months Ending May	
	1915	1916	1915	1916
Batteries	$79,618	$157,397	$853,196	$1,409,960
Dynamos or generators	84,153	133,534	1,821,666	1,322,996
Fans	28,838	33,528	210,203	331,898
Insulated wire and cables	302,029	292,086	1,658,603	2,867,088
Interior wiring supplies, etc., including fixtures	131,600	38,393	682,436	782,150
Arc lamps	1,200	2,539	29,158	18,537
Carbon filament lamps	7,593	9,833	90,491	140,684
Metal filament lamps	42,232	140,649	394,613	1,148,356
Meters and other measuring instruments	67,813	79,641	399,702	703,841
Motors	209,014	428,984	2,534,820	3,897,827
Telegraph instruments, including wireless apparatus	2,968	16,187	74,749	139,972
Telephones	57,090	358,675	1,105,019	1,145,381
Transformers	23,217	173,988	553,940	937,346
All other	764,844	1,572,175	7,316,080	12,257,840
Totals	$1,802,209	$3,437,609	$17,724,676	$27,103,876

Manufacturing and Industrial

The Roller-Smith Company, New York, has established a Philadelphia agency in charge of Eugene F. LeNoir, 1011 Franklin Bank Building.

Womble Storage Battery Manufacturing Company, which has equipped a plant at 204 Market Street, Chattanooga, Tenn., has begun manufacturing operations.

Charles G. Robin, New York, manufacturer of electrical specialties and conduit fittings, announces that, beginning Aug. 1, he will occupy the entire store at 48 William Street, New York, with a complete line of his products.

Robbins & Myers Company.—The Cincinnati office of the Robbins & Myers Company, Springfield, Ohio, has been removed from its old quarters at 9 East Third Street, Cincinnati, to 821 Union Central Building. The warehouses will be retained at the former address, 9 East Third Street.

Domestic Engineering Company to Have New Factory.—The Danis-Hunt Construction Company has received the contract for erecting a $500,000 factory building for the Domestic Engineering Company at Moraine, Ohio, a village just south of Dayton. It will be 1000 ft. in length and 270 ft. wide.

Convention of Salesmen of Willard Storage Battery Company.—The salesmen of the Willard Storage Battery Company attended a convention at the home office in Cleveland, Ohio, July 7 and 8. The business sessions were devoted to talks on service and the development of service ideas. On the evening of July 7 they enjoyed a banquet served in a large tent which was lighted with energy from Willard batteries.

Australia Manufacturing Own Insulators.—With the intention of making Australia independent of imports for her supply of insulators, the government is encouraging the domestic manufacture of this kind of electrical material. In 1911 the domestic manufacture of insulators amounted to $4,000 and importations to over $60,000. In 1915 the domestic manufacture amounted to more than $45,000 and imports to $25,000.

Mutual Electric & Machine Company.—The Mutual Electric & Machine Company, 232 West Fort Street, Detroit, Mich., has opened a Chicago office at 627 West Jackson Boulevard of that city. The new office will be in charge of J. S. Jacobson, district manager. It is planned to carry a complete stock of knife switches, cutouts, lugs and switchboard accessories at this office. Leon H. Frank, sales manager of the company, announces that the Mutual company's new catalog will be ready for distribution within a month.

Increased Appropriations for Projectors. — The Sherley bill making appropriations for fortifications and other works of defense, for the armament thereof, for the procurement of heavy ordinance for trial and service, and for other purposes has been signed by the President. The bill as reported carries appropriations aggregating $25,000,000, and also authorized contracts amounting to $12,300,000. In it provision is made for $226,700 for searchlamps for important harbors. The amount appropriated for that purpose in 1915 was only $150,000.

"Permutit" Filter Stock Being Maintained.—The Permutit Company reports that in spite of the backward deliveries of steel plates and heads, a stock of standard size "Permutit" filters up to 8 ft. in diameter is being maintained and that the company is prepared to make deliveries of "Permutit" equipments in the shortest possible time. "Permutit" itself has, since some months before the outbreak of the European war, been manufactured in the company's factory in Brooklyn, N. Y. All raw materials are readily obtainable in this country, so that the artificial zeolite is available in any quantities required. The company reports a rapidly increasing volume of business.

Large Orders for G. E. Irons.—The General Electric Company recently has been handling some large orders for electric irons. Conspicuous among these have been one for 10,000 6-lb. irons shipped during the later part of June to the Kansas City Light & Power Company, and another for 10,000 irons forwarded at approximately the same time to the Milwaukee Electric Railway & Light Company. In contradiction of a statement which appeared in the newspapers that no orders were being taken by manufacturers for irons prior to Jan. 1 delivery, the General Electric Company announces that, in spite of considerable difficulty experienced in obtaining the necessary raw materials, it is still taking orders and can make prompt shipments.

Automatic Recorder for Steam Boilers to Be Made by Wright Electric Recorder Company.—An electric device invented by James Wright for measuring and recording the water in steam boilers will be manufactured by the Wright Electric Recorder Company, Cleveland, Ohio, which was incorporated recently. A recording dial, clock and apparatus for measuring water in boilers throughout the twenty-four hours of the day constitute its principal features. It automatically signals when the water is high or low, it is stated, and when it is at the economical and at the danger point. Not only will it be an advantage in boiler economy, but it will save coal as well. The capital stock of the company is $30,000 and the incorporators are J. R. Raible, W. C. Hopkins, John Y. Brooks, H. W. Ewing and A. Frank Counts. The device will be manufactured at the factory of the Fanner Manufacturing Company for the present.

The Colonial Electrical Company, Inc., 220 Twenty-eighth Street, Newport News, Va., has recently been formed and is engaged in the electrical contracting, supply and repair business. The headquarters of the company are maintained in Newport News, while a branch office has been established at 148 Bank Street, Norfolk, Va. S. B. Batte, president of the company, has had considerable experience in telephone work and for the past ten years has been engaged in the electrical contracting business, having been connected with the following firms: Batte & Shaw, Hitt & Batte and S. B. Batte. W. L. Cooke, secretary and treasurer, was formerly a member of the firm of Coburn & Cooke. He has also been connected with the Hagerstown Railway Company, as auditor and purchasing agent, with the Charlottesville & Albemarle Railway Company as assistant treasurer and the Atlantic Electric Company of Norfolk, as salesman.

Morse Chain Company to Double Size of Plant.—The capital stock of the Morse Chain Company of Ithaca, N. Y., has lately been increased from $400,000 to $1,500,000 for expansive purposes in the shape of new buildings and additions to old ones already under way. The growth of the company is best illustrated by the successive building operations made necessary by the demand for its single product—Morse rocker-joint power transmission. From a fair-sized factory at Trumansburg, N. Y., in 1904, just about the time when electric motors came into broad commercial use, the business commenced to spurt, and in 1906 was removed to Ithaca, N. Y., to a new factory built especially for the purpose and twice as large as the former one. In 1912 it became necessary to again enlarge and the floor space was more than doubled by additions. Present plans contemplate again doubling the size of the plant, a large storage building being about completed, additions to the steel and wire mills and a new gas producer building being well under way, and another addition to the main building, increasing its total length to more than 900 ft., soon to be started. When these buildings are completed the Morse Chain Company will have a total floor space of approximately seven acres.

NEW YORK METALMARKET PRICES

	July 18 Selling Prices Bid	July 18 Selling Prices Asked	July 25 Selling Prices Bid	July 25 Selling Prices Asked
	£ s d		£ s d	
London, standard spot	88 0 0		98 0 0	
Prime Lake	25.50 to 26.00†		25.00 to 25.50†	
Electrolytic	24.50 to 25.00†		25.50 to 26.00†	
Casting	22.75 to 23.25†		23.50 to 24.00†	
Copper wire base	28.00 to 29.00†		31.00†	
Lead	6.50		6.50	
Nickel	45.00 to 50.00		45.00 to 50.00	
Sheet zinc, f.o.b. smelter	15.00		15.00	
Spelter, spot	9.17½ to 9.42½		10.42½	
Tin, straits	37.75		38.00	
Aluminum, 98 to 99 per cent	57.00 to 59.00†		57.00 to 59.00	

OLD METALS

Heavy copper and wire	19.00 to 19.50	19.50 to 20.00
Brass, heavy	11.25 to 11.50	12.25 to 12.50
Brass, light	9.00 to 9.50	10.00 to 10.25
Lead, heavy	5.25	5.50 to 5.62½
Zinc, scrap	6.00 to 6.50	7.00 to 7.50

COPPER EXPORTS

Total tons to July 25 28,917

†Nominal.

Corporate and Financial

Augusta-Aiken Railway & Electric Company, Augusta, Ga.—The annual report of the company for the year 1915 has recently been distributed. Gross electric earnings increased $33,710.49 or 10.9 per cent, with an increase in expenses of $5,429.91 or 5.2 per cent. Gross railway earnings decreased $29,342.84 or 8 per cent, and expenses decreased $19,747.69 or 9.8 per cent. Gross earnings from other departments decreased $9,750.09 or 15.4 per cent, and expenses decreased $9,563.57 or 25 per cent. Owing to depressed business conditions, due to the war, railway earnings continued unsatisfactory until Oct. 1, at which date they were over $50,000 less than for the twelve months immediately preceding. A decided improvement has been evident from that date, however, and at the present time receipts are in excess of those during 1913. The increase shown in the electric department is largely attributable to revenue arising from new contracts for wholesale power negotiated during the year. Taxes were greater by $11,250.10, due principally to a larger assessment on the hydroelectric development, which was in operation for a full year as compared with six months' operation in 1914. Interest payments required $72,146.05 additional, of which $68,750 was for six months' interest on Georgia-Carolina Power Company 5 per cent first mortgage bonds not accrued during the year previous. Economical and efficient results in operation effected a saving of $24,000 and, notwithstanding the extra financial burdens and adverse business conditions, there still remained a surplus over all charges for the year of $3,167.12. The expenditures for maintenance of the property were normal, and $50,887.97 was charged to capital for extensions to reach new power and lighting customers and for miscellaneous improvements. Contracts were closed during 1915 with power customers using 4312 hp. The total connected load on the hydroelectric power house is approximately 18,600 hp., which gives a present maximum demand load of approximately 7200 hp. Contracts for over 2000 hp. additional were closed during the first five months of this year. The revenue account for the year ended Dec. 31, compared with the previous year, follows:

	1915	1914
Gross earnings (from all sources)	$732,990	$738,373
Operating expenses, including taxes	381,255	393,886
Net earnings from operation	$351,735	$344,487
Less:		
Interest on first mortgage 5 per cent bonds	46,667	48,467
Balance	$305,068	$296,020
Interest on 5 per cent sinking fund gold bonds	151,000	150,367
	$154,068	$145,653
Interest on Georgia-Carolina Power Company first mortgage 5 per cent forty-year sinking fund gold bonds	137,500	68,750
Balance	$16,568	$76,903
Interest on floating debt	13,401	8,839
Surplus	$3,167	$68,064
Dividends on preferred stock	.....	45,000
Net surplus for year	$3,167	$23,064

Bryant Electric Company, Bridgeport, Conn.—The company has filed a certificate with the secretary of the State of Connecticut showing a reduction of its capital stock from $2,500,000 to $2,000,000.

Cities Service Company, New York, N. Y.—For June and the six months ending June 30, the company broke all former records, both in amount of earnings and in gains made over the corresponding periods of the preceding year. Gross income for June was $740,849, a gain of $446,329 over June 1915, while for the first half of 1916 gross income was $4,066,158, a gain of $1,979,497 over the first half of 1915. Earnings of the utility properties are now running at the highest rate in their history and their gains also are record-breaking. At the rate at which earnings of the strictly utility properties are now running and at which their revenues are being steadily increased, Cities Service Company can carry out its announced dividend policy over the next five years from the income received from the utility properties alone, leaving earnings from the oil properties entirely out of the estimates. For June, 1916, the surplus for the $18,134,619 common stock, after providing for all expenses and charges, including preferred dividends, was equivalent to 2.88 per cent on the outstanding issue, or at the rate of 34.56 per cent a year. For the first six months of 1916 earnings for the common stock, after all charges and preferred dividends, were equivalent to 14.83 per cent for the period, or at the rate of 29.66 per cent a year. For the twelve months ended June 30, 1916, the dividend requirements on the $34,833,792 preferred stock were earned 3.2 times, and after providing for the preferred dividends, there was left a surplus of $3,962,498 for the common stock, equivalent to 24.12 per cent on the average amount outstanding during the period, compared with a surplus for the common of $1,739,567 for the preceding twelve months equivalent to but 11.58 per cent on the outstanding amount at that time. On July 1, 1916, the company had accumulated surplus of $5,597,690 with surplus reserve of $910,354 and contingent fund of $689,383, or combined surplus and reserves of $7,197,427. With the retirement of the $7,000,000 five-year 7 per cent notes July 12, last, interest on this issue ceased and from now on the company will have no fixed charges aside from interest on $139,175 of its 5 per cent debentures not yet converted into stocks. In addition the company has no floating debt of any kind, its only indebtedness being such small current bills as may accrue during any one month. The retirement of the 7 per cent notes leaves the preferred stock with a first claim on all assets and earnings of the company.

Consolidated Light & Power Company, Mount Pleasant, Mich.—The months of litigation involving the Consolidated Light & Power Company and the Chippewa Construction Company have come to a close. The Hudson Estate of Detroit, Mich., has bought the entire interests and is now the sole owner. New articles of association have been filed under the style of the Central Michigan Light & Power Company of Mount Pleasant, the capital stock being $50,000. General offices will be at Mount Pleasant. A new dam and other improvements to the property are planned in the near future.

Delaware (Ohio) Electric Light, Heat & Power Company.—The National Utilities Company of Boston has purchased the Delaware Electric Light, Heat & Power Company. The capital stock of the company is $125,000, but it is said that the eastern company paid $160,000 for the business.

Dubuque (Iowa) Electric Company.—The property of the Union Electric Company of Dubuque has been transferred to the Dubuque Electric Company, the transaction involving over $3,000,000. I. C. Elston, Jr., of the Elston-Clifford Company, Chicago, and several associates are the purchasers. Mr. Elston will be president and H. R. Maynard of Waterloo, vice-president, and E. M. Walker, general manager of the Union Electric Company will continue in this capacity with the Dubuque Electric Company.

Massillon (Ohio) Electric & Gas Company.—Application was made to the Public Utilities Commission of Ohio on July 20 for authority to issue $2,000,000 bonds and $125,000 additional preferred stock. It was stated that only $600,000 of the bonds will be sold now. The proceeds are to be used to cancel outstanding obligations and reimburse the company for improvements and extensions made during the past year.

Public Service Electric Company, Newark, N. J.—The Board of Public Utility Commissioners of New Jersey has granted the company permission to issue capital stock for $3,000,000 to be used for extensions to its plants and system.

San Joaquin Light & Power Corporation, Fresno, Cal.—The California Railroad Commission has issued an order granting the corporation permission to issue $666,500 of first and refunding mortgage series "C" 6 per cent gold bonds at not less than 96 per cent of their face value and accrued interest. The proceeds from these bonds are to reimburse the treasury for additions and betterments already made to the properties of the company and for purchase of transformers.

Worcester (Mass.) Electric Light Company.—The board of directors has voted to call a meeting of stockholders for Aug. 30 to authorize an issue of 2000 shares of stock at $200 a share. This action was taken after the directors had received formal notice from the Massachusetts Gas and Electric Light Commission that the additional issue of stock petitioned for had been approved.

New Utility and Industrial Companies

The Standish (Mich.) Electric Light & Power Company has been incorporated with a capital stock of $5,000 to operate an electric plant in Standish.

The Shelley (Idaho) Light & Power Company has been incorporated with a capital stock of $100,000 by J. F. Shelley, T. W. Shelley and Thomas Mitchell.

The Battery Equipment Company of Cincinnati, Ohio, has been chartered with a capital stock of $10,000. The incorporators are: F. O. Andreidge, H. M. Marvin, G. P. Walker and others.

The R. H. Maple Company of Indianapolis, Ind., has been incorporated by V. H. Lockwood, R. G. Lockwood and R. H. Maple. The company is capitalized at $50,000 and proposes to deal in electrical supplies.

The Fort Worth (Tex.) Battery Company has been incorporated by R. E. Cole, A. F. Hawkins and M. F. Wortham. The company is capitalized at $3,000 and proposes to manufacture and sell electric batteries, etc.

The Equi Light Company of Paducah, Ky., has been chartered with a capital stock of $10,000 by Harry Wallace, E. C. Phelps, N. P. Wallace and B. Phelps. The company proposes to manufacture and deal in auto accessories.

The Duchesne (Utah) Power Company has been incorporated with a capital stock of $25,000. The officers are: J. S. Dean of Topeka, Kan., president; W. H. Cammerer, vice-president, and W. L. Dean, secretary and treasurer.

The Elliott Electrical Supply Company of New York, N. Y., has been incorporated by I. Cowen, I. and S. Elliott, 11 West 117th Street, New York City. The company is capitalized at $5,000 and proposes to deal in electrical supplies, hardware, etc.

Leygrand & Company of East Orange, N. J., has been incorporated by Charles O. Geyer, Felix R. Smith and Gordon Grand. The company is capitalized at $100,000 and proposes to do a general electrical and mechanical engineering business.

The Multi-Machine Company of Buffalo, N. Y., has been incorporated with a capital stock of $50,000 to manufacture machines, engines, tools, supplies, boilers, etc. The incorporators are: A. E. Davenport, H. J. Ernst and W. E. Goeckel of Buffalo, N. Y.

The A. J. Abels Company of Buffalo, N. Y., has been incorporated by R. R. Mitchell, M. B. Smith and A. J. Abels of Buffalo, N. Y. The company is capitalized at $10,000 and proposes to manufacture and deal in factory heating and power plants and temperature controlling equipment.

The Stuttgart (Ark.) Public Service Company has been chartered with a capital stock of $150,000 to construct and operate electric-light and power systems, heating plants and ice factories. The directors are: F. G. Proutt, president; T. H. Rhodes, W. A. Smith, L. P. Miles and S. P. Walker.

The Spokane (Wash.) Heat, Light & Power Company has been incorporated with a capital stock of $2,000,000 to supply steam heat, electricity, gas and water. The trustees are: H. A. Flood, H. B. Harris and R. J. Danson of Spokane, Wash., and R. E. Field and A. H. Richards of Cincinnati, Ohio.

The Commercial Electric Sign Company of New York, N. Y., has been incorporated with a capital stock of $5,000 by O. Geballe, F. P. Schavel and E. Hartwig, 440 West Forty-sixth Street, New York, N. Y. The company proposes to manufacture electric-light signs, commercial signs, and do electrical contracting work.

The Cross Port Motor Company of New York, N. Y., has been incorporated with a capital stock of $100,000 to manufacture internal combustion motors, engines, autos, patents, etc. The incorporators are: E. J. O'Connell, 417 Sterling Place; J. S. Casey, 181 Utica Avenue, and J. J. O'Connell, 114 Lincoln Place, all of Brooklyn, N. Y.

The Construction Laboratories of New York, N. Y., has filed articles of incorporation with a capital stock of $100,000 for the purpose of doing a general contracting, electrical, chemical and mechanical business, advertising, etc. The incorporators are: H. C. Luff, 124 Maiden Lane; F. E. Sturgis, W. K. Dupre, Jr., 14 Wall Street, New York, N. Y.

Trade Publications

Exhaust Heads. — The Burt Manufacturing Company, Akron, Ohio, has issued a bulletin describing its standard exhaust heads, giving dimensions and prices.

Electric Fixtures.—The New York Gas & Electric Appliance Company, 569 Broadway, New York City, has issued a catalog describing some of its new electric fixtures.

Fire Extinguishers.—A folder pointing out the advantages of the J-M fire extinguishers has been issued by the H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York.

Annunciators.—A booklet describing the new Deveau locking type electrical annunciator is now ready for distribution by the Deveau Telephone Manufacturing Company, 472 Eighteenth Street, Brooklyn, N. Y.

Hard Fiber.—The Delaware Hard Fiber Company of Wilmington, Del., has issued a catalog and price-list of its products, giving the uses of hard fiber, and illustrating the various shapes and forms made from this material.

Electric Vehicles. — Illustrations of electric commercial vehicles used for numerous purposes in different cities throughout the world are given in a folder recently distributed by the General Vehicle Company, Inc., Long Island City, N. Y.

Storage Batteries.—"On the Firing Line with Battery Bill" is the title of a booklet issued by the Edison Storage Battery Company, Orange, N. J. It is a collection of illustrated letters written by salesmen on the road on selling Edison batteries.

Wire Molding.—"Wiremold" is the title of a new booklet, issued by the American Conduit Manufacturing Company, Pittsburgh, Pa. It describes the company's new surface wire molding and shows methods of connecting and installing the molding and fittings.

Railway Equipment.—"Electrical Equipment for the Puget Sound Line of the Chicago, Milwaukee & St. Paul Railway" is the title of a booklet issued by the General Electric Company, Schenectady, N. Y., which describes and illustrates the electrification equipment used on this line.

Direct Reading Ohmmeters.—Two types of portable direct reading slide-wire ohmmeters are described in bulletin No. 300 recently sent out by the Roller-Smith Company, 233 Broadway, New York City. With one type a telephone receiver is employed to detect the balance; on the other a galvanometer is used.

Pumping Information.—Detailed information on subjects that purchasers of pumping equipment are likely to need in selecting apparatus for their requirements is presented in Catalog No. 16 recently brought out by the Standard Pump & Engine Company, Akron, Ohio. List prices of differently rated equipments, including motor-driven sets, are given and tables containing valuable pumping data are included.

Centrifugal Ejector.—Structural diagrams of a duplex centrifugal ejector and a list of standard sizes have been presented in bulletin No. E-2000 recently issued by the Yeomans Brothers Company, 231 Institute Place, Chicago. In addition to brief descriptions of equipment, there are included in the catalog typical forms of specifications for ejectors and tables of friction loss in pipes and theoretical horsepower required to raise water to various heights.

Centrifugal Pumps.—Construction details, ratings and sizes of single-stage and multi-stage motor driven pumps are given in Bulletin No. S-1000 which has just been brought out by Yeomans Brothers Company, 231 Institute Place, Chicago, Ill. Typical forms of specifications for gravity and compression house service pumps are included. The catalog refers chiefly to small pumps for house supply and general service in office buildings, apartment buildings, residences, hotels, industrial and power plants.

Storage Batteries.—The eighth edition of Section A of Bulletin issued by the Electric Storage Battery Company, Philadelphia, Pa., contains the ratings, dimensions, weights and prices of Chloride and Tudor batteries made by that company. Cost of renewals are also included. Another pamphlet touching on the charging of batteries for signaling service for telephone train dispatching has been issued by the same company.

New England

CHICOPEE, MASS. — Bonds to the amount of $45,000 have been authorized by the City Council for improvements to the municipal electric-lighting system, which include the installation of new equipment in power plant, construction of a new garage and changing the entire street-lighting system. It is proposed to substitute incandescent lamps for the arc lamps now in use.

MELROSE, MASS.—The city officials have notified the telephone and electric light company that the city intends to rebuild Main Street from Ell Pond to the Wakefield line next year. The notification is given so that the companies may complete their underground conduits. The ornamental lighting system, it is understood, will be extended from Porter Street to the Highlands within a year.

MERRIMAC, MASS.—The Massachusetts Northeastern Street Railway Company, it is reported, contemplates the construction of a new boiler house in Merrimac. F. Woodman of Haverhill is general manager.

BRIDGEPORT, CONN.—Plans are being prepared by Hering & Gregory, consulting engineers, 170 Broadway, New York, N. Y., for the installation of an electrically operated sewage pumping station.

EAST HAMPTON, CONN.—The East Haddam Electric Light Company of East Hampton is in the market for a 4400-volt and a 13,200-volt wet outdoor and indoor oil circuit breaker, electrolytic and low equivalent arresters; substation equipment, consisting of one 15-kw., 2200-volt, primary, 4-amp. secondary constant-current street-light transformers and 35 miles of No. 4 bare copper wire. L. P. Perry is general manager.

NEW BRITAIN, CONN.—Contracts have been awarded for the construction of a new power house for the North & Judd Manufacturing Company of New Britain to the B. H. Hibbard Company of New Haven, Conn., for general contract and the Berlin (Conn.) Construction Company for steel work. The boiler house will be equipped with coal bunker, automatic coal-handling apparatus and a 500-hp. water tube boiler; a 750-kw. turbine will be installed in the turbine room and space will also be provided for a 1000-kw. turbine with direct connected exciters. John A. Stevens of Lowell, Mass., is engineer.

SOUTH NORWALK, CONN.—The Board of Electrical Commissioners has awarded a contract to the J. G. White Engineering Corporation of New York, N. Y., for the designing, engineering and construction work in connection with extensions and improvements to the municipal electric-light plant, and also the installation of an ornamental street-lighting system in the Second Taxing District of the city of Norwalk. Work will begin at once.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Fifty-ninth Street and Park Avenue, New York, until Aug. 2 for installing electric-light equipment in Public School 120, teachers' and janitor's houses on Barren Island, borough of Brooklyn. Blank forms, specifications, etc., may be obtained at the above office and also at branch office 131 Livingston Street, Brooklyn.

CORONA (P. O. Flushing), N. Y.—Contracts will soon be awarded for construction of a moving picture plant, to include studio, administration buildings, power house, storehouse, garage, restaurant and office building, to be erected on Jackson Avenue, extending from Astoria Avenue to Flushing Bay, for the Fox Feature Film Corporation, at a cost of about $1,000,000. Thomas W. Lamb, 644 Eighth Avenue, New York, is architect. William Fox, 126 West Forty-sixth Street, New York, is president of the film corporation.

ENDICOTT, N. Y.—The Blanding Electric Supply Company of Binghamton has been awarded the contract for wiring the entire plant of the International Time Recorder Company at Endicott. The Blanding company will install new equipment throughout the new buildings as well as the old The installation of a 400-hp. engine and generator, directly connected, is included in the work now under way.

NEW YORK, N. Y.—Cabot Ward, park commissioner, has directed the chief engineer to take steps for removal of all overhead wires in the city parks and to allow none but temporary installations placed overhead.

NEW YORK, N. Y.—Bids will be received by Robert Adamson, fire commissioner, Eleventh Floor, Municipal Building, New York, N. Y., until Aug. 4 for furnishing three motor-driven combination chemical and hose wagons, and also seven motor-driven hose wagons. Blank forms and further information may be obtained at the above office.

NEW YORK, N. Y.—The Public Service Commission has granted the Long Island Lighting Company, 50 Church Street, New York City, which operates in Babylon, Northport, Amityville, Sayville and Islip and other towns on Long Island, permission to issue $80,000 in capital stock and $92,000 in bonds, part of the proceeds to be used for extensions and improvements.

NEW YORK, N. Y.—Bids will be received by the Board of Health, Department of Health, Centre and Walker Streets, New York, until July 31 for furnishing and installing with necessary alterations lighting fixtures in a pavilion on the grounds of the Department of Health, Kingston Avenue and Fennimore Street, borough of Brooklyn. Also for furnishing and installing with necessary alterations lighting fixtures in the medical staff house and nurses' home on the grounds of the Willard Parker Hospital, foot of East Sixteenth Street, borough of Manhattan. Bids will also be received at the same time and place for furnishing and installing electric motors and laundry machinery for the laundry building at the Municipal Sanatorium of the Department of Health, Otisville, N. Y. Bids will also be received for furnishing and installing lighting fixtures in the pavilions Nos. 8 and 9 on the grounds of the Department of Health, North Brother Island, borough of the Bronx. Plans and specifications may be seen and further information obtained at the office of the chief clerk, Department of Health.

UTICA, N. Y.—Extensive improvements, it is reported, are contemplated by the Utica Gas & Electric Company.

TITUSVILLE, PA.—The Titusville Forge Company is installing a 200-kw. turbo-generator, to be operated by exhaust steam from steam hammers and presses. The company is more than doubling the capacity of its plant; the steam turbine being installed as an auxiliary and to utilize the exhaust steam. The Titusville Light & Power Company has a ten year contract with the forge company which still has six years to run. In the issue of June 24 an item was published stating that the Titusville Forge Company was installing a 750-kw. turbo-generator set. Eugene F. McCabe is president of the Titusville Light & Power Company.

BLOOMFIELD, N. J.—Plans are being considered by Fries Brothers, manufacturers of chemicals, for the construction of a new power plant.

BUTLER, N. J.—The Common Council has passed on first reading an ordinance to appropriate $10,000 for improvements to the muncipal electric light plant. Of the proceeds $2500 will be used for improvements to power station, the same amount for extension of the distribution system and about $5000 to cover the excess cost of the original extension.

EAST ORANGE, N. J.—The City Council has granted an appropriation of $16,500 for new fire-alarm cables and other improvements to the Fire Department.

NEWARK, N. J.—The Newark Soap Company is contemplating the construction of a large boiler house in connection with its new manufacturing plant on Delancey Street, to cost about $63,000.

NEWARK, N. J.—The Board of Public Utility Commissioners has authorized the Public Service Electric Company to issue $3,000,000 in capital stock, the proceeds to be used for extensions to its plants and system.

TRENTON, N. J.—The J. A. Roebling's Sons Company is contemplating the construction of an addition to its boiler house, to cost about $20,000.

BALTIMORE, MD.—The Consolidated Gas & Electric Company, it is reported, will enlarge the substation at Monument and Constitution Streets, at a cost of $12,500. Switching equipment, for which contracts have been placed, will be installed in the new building.

CHARLESTON, W. VA.—The Virginian Power Company has closed a contract with the Charleston Interurban Railroad Company to furnish power to operate all its lines for a period of ten years. These include a 10-mile interurban line to St. Albans and one to Cabin Creek Junction, 16 miles long. The latter is to be extended to Montgomery, a distance of 10 miles, a little later, when prices of material are reduced.

SPRIGG, W. VA.—Contract has been awarded by the Tug River Power Company for addition to power house and boiler room. Two 3750-kva. turbines with necessary equipment will be installed. Orders have also been placed for equipment. The company will supply electricity to coal mines in this district and also for lighting at Williamson and Matewan. C. M. Gates of Welch is general manager.

WEST LIBERTY, W. VA.—Bids will be received by the State Board of Control, Charleston, W. Va., until Aug. 23 for construction of dormitory, including plumbing, heating and wiring, at State Normal School at West Liberty, in accordance with plans and specifications prepared by F. F. Faris, architect, Wheeling.

FRONT ROYAL, VA.—Bids will be received by the Town Council of Front Royal until Aug. 12 for construction of additions to the municipal electric-light plant as follows: (1) Enlargement of forebay and tail race and construction of new power house; (2) turbine equipment; (3) additions to present switchboard and other electrical work. Bids may be submitted on the work complete or on separate items. Plans and specifications may be seen at office of W. W. Sonner, chairman of electric light committee, or may be obtained on application to E. V. Dunstan, consulting engineer, 3420 Thirty-sixth Street, Washington, D. C., upon deposit of $10.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Puget Sound, Wash., Schedule 9911—six range boilers 14 in. in diameter, 5 ft. long. Brooklyn, N. Y., Schedule 9917—2500 ft. flexible copper steam hose; Schedule 9919—ten potato peelers, 1 hp., 120 volts; Schedule 9936—177,000 lb. steel boiler plates, 49,000 lb. common steel shapes; Schedule 9917—8694 composition unions, 672 brass angle valves, miscellaneous composition pipe fittings. Charleston, S. C., Schedule 9935—four sets of steam turbine-driven blowers. Newport, R. I., Schedule 9934—one motor-driven test pump. Philadelphia, Pa., Schedule 9916—50,000 lb. ingot copper, 20,000 lb. ferromanganese. Puget Sound, Wash., Schedule 9915—miscellaneous cold rolled sheet copper; Schedule 9912—26,500 lb. sheet sheathing copper; Schedule 9912—26,000 lb. yellow sheathing metal, 14 in. by 18 in. Boston, Mass., Schedule 9918—31,100 ft. of galvanized steel conduit; Schedule 9917—miscellaneous copper pipe; Schedule 9922—14,000 ft. flexible brass voice tubing. Mare Island, Cal., Schedule 9931—miscellaneous steel boiler tubes; Schedule 9913—22,500 ft. galvanized steel pipe. Application for proposal blanks should designate the schedule desired by number.

North Central

CALUMET, MICH.—Motor generators and dynamos will be substituted for the present gravity system at the local offices of the Western Union Telegraph Company on Fifth Street.

JACKSON, MICH.—A special election will soon be called to submit to the voters a proposal to enter into a new street-lighting contract with the Consumer's Power Company for a period of ten years. The proposed contract provides for entirely new equipment, using Mazda series nitrogen filled incandescent lamps.

JACKSON, MICH.—Bids will be received by the city manager, City Hall, Jackson, Mich., until Aug. 14 for the erection of a four-story hospital building and a one-story power house for the city of Jackson. Separate bids to be submitted on general construction, heating and plumbing, and electric wiring and equipment. Plans and specifications may be obtained upon application to Meyer J. Strum, 116 South Michigan Avenue, Chicago, Ill., architect, or to the city manager upon deposit of $15.

MENOMINEE, MICH. — The Michigan Electrochemical Company, recently organized with a capital stock of $150,000, is planning to erect a new plant in Menominee. Edward Daniell, general manager of the Menominee & Marinette Light & Traction Company, is president of the new corporation.

BLUFFTON, OHIO—At an election to be held Aug. 8 the proposal to issue $25,000 or $30,000 in bonds for the installation of a new electric-light plant will be submitted to the voters. If the bonds are authorized the system will be changed from direct to alternating current.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

CANFIELD, OHIO.—The Village Council has granted the Canfield Gas & Electric Company a franchise to construct and operate an electric-light plant here for a period of 25 years. W. Jarvis Smith, C. R. Wetmore and others are interested in the company.

CANTON, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Aug. 15 for the installation of an electric sidewalk type mail lift, new hoistway, etc., in the United States post office at Canton, Ohio. For details see proposal columns.

CINCINNATI, OHIO.—Plans are being considered by L. B. Reakirt, of the Bodmann estate, for the construction of a ten-story power building at Sixth Street and St. Clair Alley, on the site of an old building, which is to be wrecked . Power equipment will be required.

CLEVELAND, OHIO—A resolution has been introduced to the City Council authorizing that a proposal to issue $1,750,000 in bonds for enlarging the municipal electric-light plant be submitted to the voters. Commissioner of Lighting Davis has recommended that extensions be made to supply power to the Cleveland Railway Company.

CLEVELAND, OHIO.—The Nickel Plate Railroad, which was recently purchased by a group of Cleveland men, headed by O. P. and M. J. Van Sweringen, it is reported, will be equipped from Lorain to Cleveland and from Cleveland to Painesville for electrical operation. This will be done to facilitate the development of rapid transit and freight terminal in Cleveland.

COLUMBUS, OHIO.—An ordinance, it is said, will soon be submitted to the City Council providing for an expenditure of $265,000 for additions and improvements to the municipal electric-light plant. An additional turbine will be installed. Herman Gamper, engineer, has been engaged to prepare plans and specifications.

LITTLETON, OHIO—The Arapahoe Electric Light & Power Company of Littleton is contemplating the installation of a new substation, equipped with automatic regulators, and also contemplates a campaign for house wiring. O. F. Nats is superintendent and local manager.

ST. MARYS, OHIO—At an election held recently the proposal to issue bonds for improvements to the municipal electric-light plant and water-works system was carried.

FRANKFORT, KY. — The Frankfort Milling Company is contemplating equipping its flour mills for electrical operation. The present steam plant is inadequate. J. N. Moreland is proprietor.

LOUISVILLE, KY.—The Brinley-Hardy Company, plow manufacturers, contemplate changing from direct-current (isolated station) to alternating-current, central station service. If change is made new motors would be purchased.

MOUNT STERLING, KY.—The City Council is contemplating calling an election to submit to the voters the proposal to issue $30,000 in bonds for construction of a municipal electric-light plant.

ANDERSON, IND.—Plans will be prepared by City Engineer Funk for an addition to the boiler room of the municipal electric-light plant. Two new boilers will be installed in the new building this fall.

LA PORTE, IND.—The County Commissioners contemplate the construction of a power plant for the court house and jail, to cost about $10,000.

RUSSELLVILLE, IND.—The Roachdale (Ind.) Electric Light, Heat & Power Company is contemplating extending its service to Russellville.

CHICAGO, ILL.—Plans are being considered by the Woodlawn Business Men's Association for the installation of 232 arc lamps of 600 cp. on East Sixty-third Street from Cottage Grove Avenue to Stony Island Avenue, at a cost of about $32,000. Experimental lamps have already been installed.

DIXON, ILL.—The Illinois Northern Utilities Company, it is reported, is planning to rebuild its water power plant in Dixon this fall. When completed work will be started on the construction of a large steam generating plant, which will be used as an auxiliary. The company is now installing a 1000-kw. turbo-generator and auxiliary equipment in its Fifteenth Avenue station in Sterling.

LEBANON, ILL.—An election will soon be held to submit to the voters the proposal to issue $12,000 in bonds for improvements to the municipal electric-light plant.

TROY, ILL.—The village of Troy is considering a proposal submitted by L. O. Wallace, superintendent of the Southern Illinois Light & Power Company at Collinsville, to supply electricity here, furnishing a 24-hr. service.

ASHLAND, WIS.—The Ironwood & Bessemer Railway & Light Company of Ashland is installing a 6250-kva. steam turbine at its Bay Front station in Ashland, and is also installing a 3000-kw. generating unit at the Superior Falls plant on the Montreal River. The Flambeau River Power Company is to supply both the Ashland and the Ironwood companies with additional power, and is preparing to develop 20,000 kw. on the Big Falls of the Flambeau River at Tony, Wis. The Ironwood & Bessemer Railway & Light Company has recently taken two contracts which will approximate $50,000 each, and has under consideration a third power contract which will amount to $150,000 per year (minimum). A. E. Appleyard is general manager.

BROOKFIELD, WIS.—The installation of a municipal electric-light plant in Brookfield is reported to be under consideration.

EDGERTON, WIS.—The property of the Edgerton Electric Light Company has been acquired by the Janesville (Wis.) Electric Company, including the system, franchises, etc., in Edgerton and the town of Fulton, Rock County.

SHEBOYGAN, WIS.—The Citizens' Telephone Company, a subsidiary of the Wisconsin Telephone Company, has purchased a site, 120 ft. by 150 ft. at Center Avenue and North Seventh Street, on which, it is understood, it will erect a telephone exchange and office building.

HARTLAND, MINN.—Bids will be received at the office of J. A. Halvorsen, village recorder, Hartland, until Aug. 3 for the construction of an electric-lighting system, separate bids to be submitted as follows: (1) Brick building; (2) furnishing and installing oil engines, generators and switchboard; (3) electrical distribution system. Plans and specifications may be obtained at the above office and at the office of Earle D. Jackson, consulting engineer, Capital Bank Building, St. Paul, Minn.

JACKSON, MINN.—At an election held recently the proposal to issue $15,000 in bonds for improvements to the municipal electric-light plant was carried.

MAZEPPA, MINN.—Preparations are being made, it is reported, for rearranging the flume and building concrete power house for the flour mill owned by Mason, Olson & Company.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company has purchased a site, 325 ft. by 200 ft., at Chestnut Street and Lyndale Avenue on which it proposes to erect a garage and warehouse next fall.

MINNEAPOLIS, MINN.—Bids will be received by the Board of Education, Minneapolis, until Aug. 7 for mechanical equipment for alterations to the Seward School. Plans and specifications may be seen at the office of Rose & Harris, engineers, Auditorium Building, Minneapolis.

NICOLLET, MINN.—Bids will be received by G. L. Klitzke, secretary of the Board of Education, Nicollet, until Aug. 10 for construction of a school building, separate bids to be submitted on heating, electric wiring and plumbing. Plans and specifications may be seen at the office of Albert Shippel, architect, Mankato.

CLEARFIELD, IOWA.—David G. Fisher & Company, which recently purchased the electric-lighting plant at Mount Ayr, has applied for a 25-year franchise in Clearfield. The company proposes to erect a transmission line from Mount Ayr to Diagonal and thence to this city.

ELLSWORTH, IOWA.—Bonds to the amount of $4,500 have been voted for the installation of an electric-lighting system in Ellsworth.

ELMA, IOWA.—The Town Council is considering a proposal submitted by H. H. Dodds, owner of the Riceville electric plant, offering to purchase the municipal electric plant in Elma for $15,000. Mr. Dodds now supplies electricity in Riceville and McIntire and proposes to extend the service to Alta Vista, Elma and possibly to other towns in this vicinity.

FORT DODGE, IOWA—Later reports state all bids recently opened by the city for construction of a hydroelectric on the Des Moines River have been rejected. Burns & McDonnell, Interstate Building, Kansas City, Mo., are engineers.

FORT MADISON, IOWA.—Bids will be received by the Citizens Corporation, Fort Madison, until Aug. 10 for water-works improvements, separate bids to be submitted as follows: (1) For furnishing material and construction of river intake, pumping station, filtration plant, except filter equipment, and other miscellaneous improvements; (2) for furnishing and installing all pumping station machinery and equipment, including two 150-hp. boilers, high service and low service pumps, having an aggregate capacity of 11,000,000 gallons, generating equipment, steam piping, water connections and other auxiliary equipment; (3) furnishing and installing equipment in four 750,000-gal. mechanical filter units; (4) furnishing cast-iron pipe, specials, hydrants and valves and laying approximately 23 miles of water mains. Plans and specifications are on file at the office of the secretary of the corporation and at the office of Burns & McDonnell, engineers, Interstate Building, Kansas City, Mo.

MALVERN, IOWA—The Malvern Light & Power Company is contemplating the reconstruction of its transmisison line between Tabor and Malvern, a distance of 9 miles, changing it from single phase, 10,000 volts to three-phase, 33,000 volts. H. F. Boehner is secretary and manager.

MOUNT VERNON, IOWA—The Wapsie Power & Light Company of Mount Vernon expects to erect about 17 miles of 6600-volt transmission lines to the town of West Branch in about 30 days and also to erect a substation and install a switchboard panel. Kenneth Lindsay is manager.

NORTHWOOD, IOWA.—The proposal to issue bonds for a municipal electric plant was defeated at an election held recently.

PETERSON, IOWA—The Peterson Power & Milling Company is erecting a transmission line from Linn Grove to Marathon, Soo Rapids and Rembrandt, a distance of 30 miles. The company is also building a brick building and will install a 300-kw. Westinghouse steam turbine, a 188-kw. vertical generator directly connected to water wheel, and also four three-phase, 13,000-volt substations, and distributing system in the town of Rembrandt.

SHENANDOAH, IOWA—The Artificial Ice, Power, Heat & Light Company of Shenandoah is erecting a transmission line from Shenandoah to Imogene, 10 miles long. Most of the material has been purchased, but apparatus for serving the farmers along the route has not yet been bought. Frank K. Shuff is manager.

WASHINGTON, IOWA—The Iowa Gas & Electric Company of Washington contemplates the erection of 35 miles of high-tension transmission line with five substations, distributing transformers, meters, etc. Most of the material for the above improvements has been purchased but the company is in the market for an engine and generator. H. F. Darbyshire is manager.

HUNTER, MO.—The installation of an electric-light plant and ice factory in Hunter is under consideration. V. V. Kennedy is reported interested in the project.

JOPLIN, MO.—Bids will be received by A. C. Michaelis, architect, Miners Bank Building, Joplin, until Aug. 2 for construc-of a five-story department building at Joplin for the Dubuque Realty Company. Separate bids to be submitted on plumbing, heating, electric wiring, elevators and dumb waiter and sprinkler system. Plans and specifications may be obtained from the architect upon deposit of $25.

LAMONTE, MO.—The Lamonte Light & Power Company, recently organized, has been granted a franchise to supply electricity in Lamonte. Energy to operate the system will be transmitted from Warrensburg. R. W. Morrisson and others are interested in the company.

ST. JOSEPH, MO.—The St. Joseph Railway, Light, Heat & Power Company has submitted a proposal to City Council offering to supply the city with electricity at an average rate of 1.58 cents per kw.-hr. for street-lighting. The city is contemplating rebuilding the municipal electric-lighting plant.

URICH, MO.—Plans, it is reported, are being considered for rebuilding the local electric-light plant which was recently destroyed by fire.

FARGO, N. D.—Bids will be received by A. R. Watkins, city auditor of the city of Fargo, until Aug. 16 for the installation of mechanical stokers or smoke eliminating and fuel saving devices, to be installed in the boiler furnaces of the water-works pumping station. Bids will be received on the basis of installation of one, two or three furnaces.

LA MOURE, N. D.—The contract for the construction of a combined electric-light plant and laundry is reported to have been awarded to Peder Gjertson.

NORTHVILLE, S. D.—At an election to be held Aug. 1 the proposal to issue $5,000 in bonds for the installation of an electric-light plant will be submitted to the voters.

BLUE HILL, NEB.—The contract for extensions and improvements to the municipal electric-light plant and water-works system has been awarded to William C. Southman of Grand Island.

NORFOLK, NEB.—Extensions to the street-lighting system are under consideration by the City Council.

POLK, NEB.—The town officials have

contracted with a transmission company to erect a transmission line to the town of Polk to supply electricity to operate the municipal electric-lighting system. When the line is completed the local plant will be closed down.

SCOTIA, NEB.—The City Council has engaged the Martz Engineering Company, Orpheum Building, Lincoln, Neb., to prepare plans for the proposed municipal electric-light plant and water-works system, for which $15,000 in bonds have been voted.

ALMENA, KAN.—An election will be held July 31 to submit to the voters the proposal to issue $4,500 in bonds to rebuild the electric plant recently destroyed by fire.

GEUDA SPRINGS, KAN.—The installation of an electric-lighting system in Geuda Springs is under consideration. Energy will probably be secured from the plant of the Kansas Gas & Electric Company at Arkansas City.

NORWICH, KAN.—Preliminary plans are being prepared by W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., consulting engineers, for the construction of a municipal electric-light plant in Norwich, to cost about $12,500.

WICHITA, KAN.—The Kansas Gas & Electric Company is planning to erect a 60,000-volt transmission line from Burrton to Buhler, and also new 22,000-volt transmission lines to Augusta; from Newton to Moundridge, and also to Mount Hope and Haven.

Southern States

BRIDGEWATER, N. C.—Contracts have been awarded by the Western Carolina Power Company, a subsidary of the Southern Power Company of Charlotte, to Hardaway Contracting Company of Columbus, Ga., and to Reinhart & Dennis Company of Charlottesville, Va., aggregating about $2,000,000, for the construction of three dams across the Catawba River, at Bridgewater, Paddy Creek and Linville River, developing about 26,000 hp. The power house will be located at Linville River dam.

COLUMBIA, S. C.—The Columbia Railway, Gas & Electric Company is changing the voltage of its power lines to large consumers from 3200 to 13,000 volts.

BUTLER, GA.—The Butler Light Company is contemplating the construction of a dam at Little Mill site on Beaver Creek, where it proposes to build a hydroelectric plant. J. A. Childs and H. A. Childs are interested in the company.

ELBERTON, GA.—The City Council has decided to install a larger dynamo at the pumping station to be used an as auxiliary plant. The cost is estimated at $1,200.

CHIPLEY, FLA.—The Chipley Light & Power Company contemplates the erection of 2 miles of transmission line to the Lime Quarry, which is to be operated by electricity. E. H. Hale is general manager.

DE LAND, FLA.—The De Land Electric Light, Power & Ice Company will erect thirteen 35-ft. steel poles for ornamental lighting system, with cross arms above for wires. E. L. Hon is treasurer and manager.

MANATEE, FLA.—The city of Manatee is considering the construction of a municipal electric-light plant, to cost about $12,000. C. H. Combs is city engineer.

WINTER HAVEN, FLA.—The Winter Haven Water, Ice & Light Company is contemplating the erection of 4 miles of transmission lines.

BENTON, TENN.—The Benton Light & Power Company, recently organized, has awarded a contract to W. T. Bidwell to construct a distributing system in Benton, at $2,400. The company has contracted with the Tennessee Power Company of Chattanooga to supply energy to operate the system. J. D. Clemer is president.

NASHVILLE, TENN.—The city of Nashville, we are informed, does not contemplate the installation of a municipal electric-light plant as reported in the issue of July 15.

ANDALUSIA, ALA.—The Andalusia Light & Power Company contemplates the installation of a 200-hp. boiler, a 175-kw. generator and engine, super-heater and condenser. Plans for the proposed improvement have not yet been completed. J. N. McClurg is manager.

TROY, ALA.—New equipment, including two 300-hp. Babcock & Wilcox boilers, one 600-hp. tandem compound condensing Buckeye engine, directly connected to a 400-kw. generator will be installed in the municipal electric plant. Machinery has been purchased. E. T. Freeman is superintendent.

WEDOWEE, ALA.—Plans are being considered for the installation of a new engine in the local electric-light plant, to be used as an auxiliary during the high and low water periods. W. M. Dobson is owner.

BRINKLEY, ARK.—The property of the Brinkley Water & Light Company has recently been taken over by the Commonwealth Utilities Company, Central National Bank Building, St. Louis, Mo. J. E. Strasbaugh is superintendent of the Brinkley company.

STUTTGART, ARK.—The Stuttgart Public Service Company, recently organized, proposes to construct an electric-light and power plant and water-works system to supply electrical and water service in Stuttgart and surrounding territory. Contracts will soon be awarded for material, including poles, pipe, wires, engines, equipment for power plant, building, pumps and all accessories. The company would like to receive catalogs and to correspond with manufacturers, etc., relative to the proposed work. Some of the work will be let by contract and the remainder will be handled by the company. It will carry a full line of electrical appliances. The cost of the work is estimated at $150,000. The company has a 50-year franchise to furnish both electricity and water in the city of Stuttgart.

CALVIN, OKLA.—The Council is considering calling an election to submit the proposal to grant Williams & Mann of Adamson a franchise to supply electricity in Calvin. If granted a franchise it is proposed to move the electric plant from Adamson to Calvin.

MIDLAND, TEX.—The Midland Light & Ice Company is contemplating increasing the output of its electric plant and other improvements to its system. The company has secured contract to pump the city water supply.

TAYLOR, TEX.—Extensions to the street-lighting system in Taylor are under consideration.

TERRELL, TEX.—The City Council is negotiating with the Texas Power & Light Company with a view of selling the municipal electric power plant and the purchase of energy from the company to operate the municipal lighting system.

Pacific States

SPOKANE, WASH.—Plans and estimates for the Main Avenue ornamental lighting system, from Division to Monroe Street, have been filed with Commissioner Fassett. The cost of the improvements is estimated at $59,000, which includes maintenance for 10 years.

PORTLAND, ORE.—Plans and specifications are being prepared by the engineering department of the Pacific Power & Light Company, Spaulding Building, Portland, for the erection of several substations, steel construction, to be built on the company's properties in Eastern Washington, where the company serves about 36 cities and towns.

BURBANK, CAL.—Improvements to the municipal electric-light plant, involving an expenditure of $20,000, have just been completed. The ornamental street-lighting system may possibly be extended a distance of six blocks. F. C. Miller is manager.

FRESNO, CAL.—The State Railroad Commission has authorized the San Joaquin Light & Power Corporation of Fresno to issue $666,500 in bonds, the proceeds to be used to reimburse the treasury for additions and improvements completed and for the purchase of transformers.

FRESNO, CAL.—The San Joaquin Light & Power Corporation of Fresno is building a 2000-kw. steam plant at Betteraoia, Santa Barbara County; also a second hydroelectric plant of 3000 kw. capacity on North fork of San Joaquin River, distributing and connecting lines all over the system and also a few transformer stations. Orders for materials have already been placed. A. G. Wishon is general manager.

LINDSAY, CAL.—Arrangements are being made by the Visalia Electric Railroad Company to extend its Visalia branch from Exeter to Lindsay, thence to the El Mirador orange district. Right of way has practically been secured.

PHOENIX, ARIZ.—The Pacific Gas & Electric Company has agreed to lower its rates for electricity in Phoenix, providing it is able to make a new contract for energy from the plant of the United States Reclamation Service. If unable to make satisfactory arrangements the company contemplates providing its own energy.

PRESCOTT, ARIZ.—The Arizona Power Company of Prescott expects to connect up about 1000 hp. of new mining consumers; also to erect a few short 11,000-volt lines. M. V. Watson is general manager.

TOMBSTONE, ARIZ.—The City Council has granted E. L. Wright a franchise to construct and operate an electric-light plant in Tombstone.

ANACONDA, MONT.—The City Council has passed a resolution creating an improvement district for the installation of a special ornamental lighting system on West Broadway from Idaho to Emmett Street. About 56 lamps similar to those in the business district will be erected.

LEWISTOWN, MONT.—Arrangements have been completed by the Montana Power Company for the construction of a transmission line from Lewistown to Twodot and thence to Harlowtown, through Judith Gap. The proposed line will carry 100,000 volts from Twodot to Harlowtown and there reduced to 50,000 volts. A substation will be erected at Harlowtown.

LYONS, COL.—Plans are being considered by the City Council for the installation of a municipal electric-light plant.

Canada

BONNINGTON FALLS, B. C.—The West Kootenay Power & Light Company of Rossland, it is reported, will install a new 8000-hp. generating unit at its plant at Upper Bonnington Falls.

WINNIPEG, MAN.—Bids will be received by S. C. Oxen, deputy minister of public works, Winnipeg, until Aug. 21 for various work required for the completion of the partly erected new Parliament Buildings on Kennedy Street. Bids may be submitted on the whole or separate parts of the work.

BRAMPTON, ONT.—The Town Council has adopted a resolution authorizing the Hydro-Electric Power Commission to secure tenders on three 150-kva. and on three 300-kva. transformers for the local substation.

COBALT, ONT.—Right of way is now being cleared for the erection of the proposed transmission line from Cobalt to Kirkland, a distance of 65 miles. The line, it is expected, will be completed this fall.

NIAGARA FALLS, ONT.—The plant of the Ontario Distributing Company in Stamford and Niagara Townships will be taken over by the Hydro-Electric Power Commission of Ontario, which will operate the system until such time as legislation is passed to give the township the right to operate its own plant. The township recently passed a by-law authorizing an issue of $28,000 in debentures to purchase the plant.

SMITH FALLS, ONT.—Steps have been taken by the Town Council to have the Hydro-Electric Power Commission of Ontario extend its service to this town.

STRATFORD, ONT.—Plans are being prepared by the engineers of the Hydro-Electric Power Commission of Ontario for the erection of a new building to replace the old boiler house adjoining the old electric distributing system. The cost is estimated at $11,000.

TORONTO, ONT.—A permit has been issued by the city architect to the Hospital for Sick Children for the erection of a one-story power house on Laplante Avenue, near the college, to cost about $9,000.

MONTREAL, QUE.—A contract has been awarded by the Board of Control to M. J. Stack & Company for the construction of conduits along St. Lawrence Street, from Craig to Sherbrooke Street, at $57,334.

ASSINIBOIA, SASK.—Tenders will be received by J. R. Nolan, secretary-treasurer, Assiniboia, until Aug. 15 (extension of date from Aug. 8) for furnishing one 150-hp. internal combustion engine, generator, exciter, switchboard and other apparatus; poles, wire and line material. Plans and specifications may be obtained from Murphy & Underwood, Saskatoon, consulting engineers.

Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Aug. 11 for furnishing door and window hardware, elevators, dumbwaiters, steel cable, refrigerator, bone-black and spud timbers. Blanks and general information relating to the circular (No. 1067) may be obtained at the above office and at the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

1,190,654. GAS FILTERING OR SEPARATING VALVE; H. H. M. Kammerhoff, Orange, N. J. App. filed Feb. 9, 1914. For separating liquid from gases in battery.

1,190,664. OUTLET BOX; J. T. Meleady, Newark, N. J. App. filed Oct. 29, 1914. Means for holding the pipe of a lighting fixture.

1,190,680. ARRANGEMENT FOR EXCITATION OF CONTINUOUS CURRENT GENERATORS; L. Schon, Essen-on-the-Ruhr, Germany. App. filed Jan. 7, 1914. Controlling dynamo.

1,190,685. PERMUTATION SWITCH-LOCK; E. C. Teachout and E. L. Harrison, Flint, Mich. Filed Oct. 22, 1915. For ignition circuits.

1,190,727. CIRCUIT-CLOSING COMBINATION ALARM-CLOCK; J. E. Christie, Salt Lake City, Utah. App. filed April 5, 1915. Gives alarm when wrong combination is moved.

1,190,730. ELECTRIC LAMP; J. L. Corcoran, Cincinnati, Ohio. App. filed July 19, 1915. For attachment to ordinary dry cell.

1,190,737. ART OR METHOD OF MAKING TRANSFER-ROLLS FOR PRODUCING UNDER-SURFACE OR INTAGLIO PRINTING-PLATES; W. S. Eaton, Sag Harbor, N. Y. App. filed Oct. 23, 1913. Eliminates hand work upon the original or master.

1,190,750. PLUG; C. E. Godley, Detroit, Mich. App. filed June 28, 1913. Spring pressed plunger type.

1,190,763. INSULATOR-CLAMP; E. G. Hatch, New York, N. Y. App. filed Aug. 9, 1913. For pin type insulators.

1,190,766. INSULATING-SUPPORT; A. S. Hubbard, New York, N. Y. App. filed Aug 13, 1913 For storage tanks.

1,190,773. ELECTRIC CARTRIDGE FUSE; W. R. Koen, Flat River, Mo. App. filed Feb. 24. 1915. Fusible strip detachably held.

1,190,780. ELECTRIC HEATER; J. F. McElroy, Albany, N. Y. App. filed March 1, 1913. Controls air current with respect to heating capacity of coils.

1,190,785. IGNITION-DYNAMO; C. T. Mason, Sumter, S. C. App. filed Jan. 25, 1915. Simplified construction and improved insulation.

1,190,795. INCUBATOR; L. F. Perkett, Traverse City, Mich. App. filed April 1, 1915. Heated by hot water circulation.

1,190,814. INSULATING COMPOSITION AND PROCESS OF PRODUCING IT; H. C. Tazewell, Wilmington, Del. App. filed Feb. 1, 1915. For repair of commutators.

1,190,815. PLASTIC COMPOSITION AND PROCESS OF MAKING IT; H. C. Tazewell, Wilmington, Del. App. filed Feb. 1, 1915. Creosote, oil, shellac, filling material and alum.

1,190,820. ELECTRICALLY OPERATIVE CALENDAR DEVICE; G. N. Tsumura, Mountain View, Cal. App. filed May 29, 1915. Controlled by clock.

1,190,823. TRIPPING MECHANISM FOR IGNITERS; H. R. Van Deventer, Sumter, S. C. App. filed Jan. 15, 1915. Oscillating magneto structure.

1,190,831. APPLIANCE FOR TREATING GOITER; F. C. Werner, Watertown, Wis. App. filed Aug. 9, 1915. Necklace for applying galvanic current to parts affected.

1,190,836. COMBINATION POTHEAD AND SERIES CUT-OUT; P. F. Williams, Chicago, Ill. App. filed Dec. 23, 1908. Air tight and water tight.

1,190,839. SPEED-CONTROLLER; J. G. Aceves, New York, N. Y. App. filed March 24, 1915. Maintains prime mover at speed of pilot motor.

1,190,845. PROCESS FOR ORGANIC SYNTHESIS; L. H. Baekeland and A. H. Peter, New York, N. Y. App. filed July 10, 1912. For manufacturing tartaric acid, etc.

1,190,856. ELECTRIC FURNACE; J. W. Brown, Lakewood, Ohio. App. filed Aug. 12, 1912. For graphitization of brushes.

1,190,869. QUENCH-SPARK DISCHARGER; L. De Forest, New York, N. Y. App. filed April 24, 1915. Eliminates danger of arcing across spark gap.

1,190,878. METHOD OF OPERATING ELECTRIC BATTERIES; P. A. Emanuel, Aiken, S. C. App. filed Dec. 6, 1915. Yields constant current without rapidly diminishing intensity.

1,190,879. METHOD OF REGENERATING ELECTRIC BATTERIES; P. A. Amanuel, Aiken, S. C. App. filed Dec. 6, 1915. Circulates salt through battery by hydrogen under pressure.

1,190,880. ELECTRIC CELL; P. A. Emanuel, Aiken, S. C. App. filed Dec. 10, 1915. For use in submarines—spherical construction.

1,190,884. SAFETY DEVICE; E. L. Gale, Sr., Yonkers, N. Y. App. filed Nov. 20, 1912. Applied to elevators.

Record of Electrical Patents

Notes on United States Patents issued July 18, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,190,886. ELECTROLYTIC CONDENSER OR ELECTROLYTIC VALVE; G. Giles, Fribourg, Switzerland. App. filed March 11, 1916. Includes aluminum rods.

1,190,888. SWITCHING MECHANISM; D. D. Gordon, Chicago, Ill. App. filed Feb. 2, 1915. Key socket with oscillating contact.

1,190,902. CAN-BODY SEAM-WELDING MACHINE; H. H. Hood, Chicago, Ill. App. filed April 18, 1914. Welds and delivers completed can-bodies (42 claims).

1,190,903. ELECTRICAL SWITCH; B. D. Horton, Detroit, Mich. App. filed Nov. 18, 1913. Inclosed type.

1,190,922. TROLLEY; M. Lev, Jr., near Los Angeles, Cal. App. filed June 28, 1915 Improved contact features.

1,190,923. CONTROLLING MECHANISM FOR INDUCTION MOTORS; D. L. Lindquist, Yonkers, N. Y. App. filed March 7, 1911. For oscillating purposes.

1,190,924. ALTERNATING-CURRENT-MOTOR CONTROL; D. L. Lindquist, Yonkers, N. Y. App. filed June 5, 1913. For furnace or skip hoist.

1,190,969. CONTROLLING APPARATUS FOR ELEVATORS; W. C. Strang, Yonkers, N. Y. App. filed Dec. 4, 1912. Automatic doubling of elevator speed.

1,190,931. TERMINAL CONNECTOR; W. C. Maynard, Miami, Fla. App. filed Dec. 1, 1915. For connecting wire to batteries.

1,190,973. TRANSMITTING MEANS FOR WIRELESS TELEGRAPHY; C. M. Agner, Sacramento, Cal. App. filed June 8, 1914. Enables sending of signals by unskilled persons.

1,190,978. TEMPERATURE MEASURING DEVICE FOR SURGICAL INSTRUMENTS; L. D. Bliss, North Takoma, Md. App. filed May 27, 1916. Indicates at distant point temperature of the operating head.

1,190,982. ELECTRODE FOR STORAGE BATTERIES; C. C. Carpenter, Buffalo, N. Y. App. filed Feb. 3, 1909. Action takes place on pins without affecting core of flakes.

1,190,989. STORAGE BATTERY PLATE AND PROCESS OF FORMING THE SAME; F. Engel, Buffalo, N. Y. App. filed Feb. 20, 1909. Kneads the blank to increase its area and to densify.

1,191,005. SAFETY TROLLEY-HARP; W. A. Jenkins and P. J. Lincoln, Birmingham, Ala. App. filed Sept. 4, 1915. For use in mines.

1,191,023. APPARATUS FOR DISPLAYING ADVERTISEMENTS, SIGNALING AND THE LIKE; J. P. Naylor, Dulwich, Eng. App. filed Aug. 2, 1911. Lamp flashing mechanism.

1,191,024. FIRE-ALARM; J. T. Nelson, Belton, S. C. App. filed Dec. 15, 1915. Indicates section where fire occurs.

1,191,054. TROLLEY-STAND; M. A. Yeakley, Canton, Ohio. App. filed Nov. 3, 1908. Trolley induces friction between pole and stand.

1,191,055. TROLLEY-STAND; M. A. Yeakley, Canton, Ohio. App. filed Dec. 22, 1908. Compression means to elevate the carrier.

1,191,060. TERMINAL-BOX; W. L. Bliss, Niagara Falls, N. Y. App. filed May 4, 1912. Can be secured directly to generator.

1,191,070. ELECTRIC BATTERY; P. A. Emanuel, Aiken, S. C. App. filed Nov. 5, 1915. Removes zinc sulphate periodically.

1,191,078. ARMORED CABLE COUPLING; R. M. Hutton, Philadelphia, Pa. App. filed April 22, 1915. Prevents rotary movement of cable.

1,191,083. ELECTRIC MACHINE; C. K. Kettering, Dayton, Ohio. App. filed May 24, 1912. Combined timer and distributor.

1,191,087. TRAIN CONTROL SYSTEM; A. A. Laughon, Roanoke, Va. App. filed Oct. 16, 1914. Ramp rail system.

1,191,129. REGULATOR FOR USE IN CHARGING ACCUMULATOR CELLS FOR MOTOR CAR LIGHTING AND STARTING AND FOR SIMILAR PURPOSES; W. H. Scott, Norwich, Eng. App. filed June 22, 1914. Carbon pile structure.

1,191,326. ELECTRIC SWITCH; J. F. McElroy, dec'd., Albany, N. Y. App. filed Feb. 27, 1912. Operated by fluid pressure.

1,191,140. SLEET CRAPER FOR TROLLEY WIRES; W. H. Ahrens, Canandaigua, N. Y. App. filed March 23, 1916. Can be quickly applied.

1,191,146. CIRCUIT BREAKER; H. S. Beakes, Williamsburg, Pa. App. filed Oct. 23, 1913. Overload types.

1,191,152. AUTOMATIC TRUNK SELECTOR; A. M. Bullard, New York, N. Y. App. filed Sept. 10, 1906. Test trunk lines by groups.

1,191,158 ELECTRIC SYSTEM; F. Conrad, Swissvale, Pa. App. filed Sept. 4, 1913. Combined control and telegraph system.

1,191,167. RELAY; J. Erickson, Chicago, Ill. App. filed Oct. 7, 1912. For telephone systems.

1,191,177. ELECTRIC METERING SYSTEM; V. S. Hardey, Chicago, Ill. App. filed Sept. 7, 1915. Accumulates registration of a number of registers.

1,191,186. INSULATORS; R. P. Jackson, Edgewood Park, Pa. App. filed Dec. 21, 1910. Prevents forging over on vertical insulators.

1,191,192. RECEPTACLE CLOSURE; C. J. Klein, Milwaukee, Wis. App. filed Nov. 5, 1913. Sliding door construction for base board outlets.

1,191,196. ELECTRIC OVEN HEATING UNIT; F. Kuhn and F. E. Shailor, Detroit, Mich. App. filed May 8, 1915. Removable element guarded against short circuiting.

1,191,197. ELECTRIC STOVE; F. Kuhn and F. Shailor, Detroit Mich. App. filed May 8, 1915. Shield construction for mint.

1,191,209. INDUCTION MOTOR WINDING; F. S. Martin, Edgewood Park, Pa. App. filed May 22, 1911. Squirrel cage type.

1,191,210. TELEPHONE INTERCOMMUNICATING AND SUPERVISORY SYSTEM; T. G. Martin, Chicago, Ill. App. filed March 30, 1909. Semi- or wholly automatic.

1,191,238. ELECTRIC HEATING UNIT; F. E. Shailor, Detroit, Mich. App. filed Oct. 25, 1913. Insulated and armored.

1,191,249. SELF-WINDING CLOCK; W. J. Van Osdel, Chicago, Ill. App. filed June 7, 1915. Constant and steady operation of balance wheel.

1,191,262. ELECTRICAL BLOCK SIGNALLING APPARATUS FOR RAILWAYS; B. F. Wooding, Denver, Col. App. filed Sept. 24, 1910. Closed-circuit magnet on each train.

1,191,265. TELEPHONE EXCHANGE SYSTEM; J. L. Wright, Cleveland, Ohio. App. filed June 9, 1914. Automatic switching.

1,191,273. AUTOMATIC RESISTANCE CONTROLLER; L. Bradley, Milwaukee, Wis. App. filed Jan. 22, 1914. Auto control carbon pile.

1,191,284. ELECTRIC SWITCH; W. B. Crossland, Newport, Ark. App. filed April 9, 1915. Operated gradually—has small resistance.

1,191,286. ELECTRIC COOKING APPARATUS; F. V. Detwiler, Chicago, Ill. App. filed Feb. 20, 1913. Automobile temperature regulation.

1,191,289. ARC LAMP; W. Dietz, Leutzsch, Germany. App. filed April 30, 1914. For extinguishing or dimming street lights.

1,191,300. AUTOMATIC ELECTROLYTIC CELL; J. M. Goodman, St. Louis, Mo. App. filed Oct. 4, 1915. Maximum and then progressive electrolytic action.

1,191,327. PARTITION JUNCTION BOX; J. F. McElroy, Albany, N. Y. App. filed July 15, 1914. Includes a switch.

1,191,336. THERMOSTATIC SWITCH; C. C. Nuckols, Albany, N. Y. App. filed Oct. 25, 1913. Corrugated metallic tube filled with liquid.

1,191,347. LOCK; E. A. Rupert, Aberdeen, Wash. App. filed July 28, 1915. Particularly for film boxes.

1,191,356. REPLENISHING ELECTROLYTIC CELLS; W. S. Smith, Grosse Ile, Mich. App. filed June 3, 1915. Maintains level by hydrostatic equilibrium.

1,191,358. ELECTRICAL APPLIANCE; S. E. Spaulding, Milton, Wash. App. filed April 13, 1916. For treatment of goitre.

1,191,386. APPARATUS FOR USE IN AND IN CONNECTION WITH ELECTROLYTIC PROCESSES; A. E. Battle, Aldgate, London, Eng. App. filed May 24, 1915. For removing tin from tinned sheets.

1,191,414. SAFETY BLOCK SIGNAL; F. W. Gerlach, Cumberland, Iowa. App. filed May 6, 1913. Automatic switch operating mechanism.